

LEVERAGING THE SOCIAL DETERMINANTS OF HEALTH: WHAT WORKS?

JUNE 2015



FOUNDATION
MASSACHUSETTS

*prepared for the Blue Cross Blue Shield of Massachusetts Foundation by
Lauren A. Taylor, Caitlin E. Coyle, Chima Ndumele, Erika Rogan,
Maureen Canavan, Leslie Curry, and Elizabeth H. Bradley*

Yale Global Health Leadership Institute

TABLE OF CONTENTS

EXECUTIVE SUMMARY.....	3
INTRODUCTION	8
SECTION 1: THE MASSACHUSETTS CONTEXT	10
SECTION 2: THE HEALTH IMPACT OF SOCIAL SERVICES	11
HOUSING.....	11
NUTRITIONAL ASSISTANCE.....	15
WOMEN, INFANTS, AND CHILDREN (WIC)	16
LOW-INCOME FAMILIES AND OLDER ADULTS	17
EDUCATION.....	18
NEIGHBORHOOD CONDITIONS AND PUBLIC SAFETY	18
INCOME SUPPORT.....	19
SECTION 3: THE HEALTH IMPACT OF PARTNERSHIPS BETWEEN HEALTH CARE AND SOCIAL SERVICES	21
CASE MANAGEMENT AND CARE COORDINATION	21
COMMUNITY OUTREACH AND MOBILE CLINICS	26
INTEGRATED HEALTH CARE AND HOUSING SERVICES	28
SECTION 4: GAPS IN THE LITERATURE AND AREAS FOR FURTHER RESEARCH	31
CONCLUSION	33
BIBLIOGRAPHY.....	34
APPENDICES.....	42
APPENDIX A: METHODS	42
APPENDIX B: LIST OF NO EFFECT PAPERS	44
APPENDIX C: SUMMARY BOXES.....	45

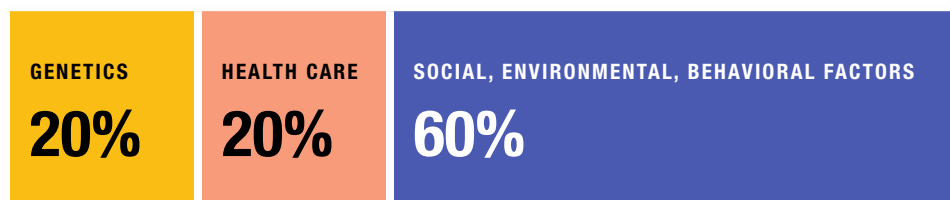
EXECUTIVE SUMMARY

Social determinants of health—which encompass social, behavioral, and environmental influences on one’s health—have taken center stage in recent health policy discussions, particularly with the growing focus on global payment, accountable care organizations, and other initiatives focusing on improving population health. Research indicates that greater attention to social determinants of health may both improve Americans’ health and reduce health care costs. Nevertheless, translating this evidence into actionable recommendations for policy makers and others has been challenging. This report evaluates and summarizes the evidence base for interventions that address social determinants of health, paying special attention to the innovative models that may improve health outcomes and reduce health care costs and that may be applicable in the Massachusetts policy context. Summarized below are key conclusions and recommendations based on this evaluation.

First, the existing literature is clear about the importance of social determinants of health in improving the health of populations. Extensive scientific literature has investigated the relative contributions of genetics, health care, and social, environmental, and behavioral factors in promoting health and reducing premature mortality (Chiu et al., 2009; Lee & Paxman, 1997). *These studies uniformly suggest that nonmedical factors play a substantially larger role than do medical factors in health.*

WHAT DETERMINES HEALTH?

(ADAPTED FROM MCGINNIS ET AL., 2002)



Second, there is strong evidence that increased investment in selected social services as well as various models of partnership between health care and social services can confer substantial health benefits and reduce health care costs for targeted populations. These programs may be deserving of immediate attention from Massachusetts policy makers, providers, plans, and other stakeholders. The programs include:

- **Housing support for low-income individuals and families:** The evidence demonstrating a direct relationship between housing interventions and health outcomes within low-income and otherwise vulnerable populations is expansive. The studies that were reviewed here (see Section 2: The Health Impacts of Social Services—Housing) indicate that providing housing support for low-income, high-need individuals results in net savings due to reduced health care costs. In some studies, the medical savings more than offset the additional costs of providing housing supports. The net savings range from \$9,000 per person per year to nearly \$30,000 per person per year for the Housing First model, a harm-reduction approach in which

adults who are homeless and who have behavioral health conditions are provided supportive housing without having to abstain from drugs and alcohol (Larimer et al., 2009; Massachusetts Housing and Shelter Alliance, 2009). The 10th Decile Project found that for every \$1 spent, there was a savings of \$2 in reduced spending the following year and \$6 savings in subsequent years (Burns, Sumner, & Lee, 2013). Furthermore, the evidence indicates that the integration of housing with health care services can result in improved health outcomes.

- Nutritional assistance for high-risk women, infants, and children as well as older adults and people with disabilities:** The evidence base for health impacts of nutritional assistance programs is robust (see Section 2: The Health Impact of Social Services—Nutritional Assistance). For example, observation of participants in the Supplemental Nutrition Program for Women, Infants, and Children (WIC) showed lower infant mortality rates and higher average birth weights for WIC participants than for non-WIC participants (Foster, Jiang, & Gibson-Davis, 2010). Moreover, a review by the Government Accountability Office (GAO) in 1992 reported that WIC cost \$296 million per year but avoided more than \$472 million in expected federal and state Medicaid costs (U.S. GAO, 1992). Similarly, national evidence indicates that home-delivered meals for older adults and people with disabilities improve physical and mental health and reduce Medicaid costs. One study estimated that every \$25 increase in home-delivered meals per older adult would be associated with a 1 percent decline in nursing home admissions (Thomas & Mor, 2013).
- Case management and community outreach for high-need, low-income families and older adults as well as for children with asthma:** The studies reviewed here (see Section 3: The Health Impact of Partnerships Between Health Care and Social Services—Case Management and Care Coordination) suggest that these vulnerable populations experience health gains when their care is coordinated across primary, specialty, behavioral, and social services and that hospitalizations and emergency department visits are demonstrably reduced. For example, studies of the Nurse-Family Partnership consistently found lower rates of infant and child mortality, lower total Medicaid spending, and improved mental health rela-

*The **10TH DECILE PROJECT** is a public-private partnership that provides permanent supportive housing to those homeless patients identified by hospitals as having the highest public and hospital costs.*

*The **SUPPLEMENTAL NUTRITION PROGRAM FOR WOMEN, INFANTS, AND CHILDREN (WIC)** provides federal grants to states for supplemental foods, health care referrals, and nutrition education for low-income pregnant, breastfeeding, and non-breastfeeding postpartum women, and to infants and children up to age five who are found to be at nutritional risk.*

*The **NURSE-FAMILY PARTNERSHIP** is a program that serves at-risk mothers who have recently had their first child and enables nurses to visit the mothers at home and assist with building competency in child care, developing self-care, completing education, and finding employment.*

tive to groups that do not participate in the Nurse-Family Partnership (Olds et al., 2007; Olds et al., 2014; Eckenrode et al., 2010; Olds et al., 2004). A cost-effectiveness analysis of the Memphis Nurse-Family Partnership site found a savings in medical and social service spending over a 12-year follow-up period that exceeded program costs by \$789 per family (Olds et al., 2010). In addition, an evaluation of the Geriatric Resources for Assessment and Care of Elders (GRACE) model of care demonstrated that GRACE model participants were more likely to score better on a self-rated health survey. Moreover, the participants in the GRACE model had a lower rate of visits to the emergency department than did a comparison group that did not receive this model of care (Counsell et al., 2007). Finally, an evaluation of the Boston Children's Hospital Community Asthma Initiative (CAI) demonstrated significant declines in hospitalizations experienced by program participants relative to the control group. An analysis of these reductions as well as the program costs revealed a strong return on investment: for every \$1 invested, \$1.33 was saved (Bhaumik et al., 2013).

- **Integrated Health Care and Housing Services for at-risk individuals and families:** There is a growing literature (see Section 3: The Health Impact of Partnerships Between Health Care and Social Services) that suggests partnerships between health care and social service providers, particularly housing service providers, have been effective in improving health outcomes in certain high-need populations. Though more cost-effectiveness analyses are needed, studies have shown health care cost reductions. The Bud Clark Commons pilot intervention in Oregon demonstrated a 55 percent decrease in total monthly Medicaid costs when comparing the year prior to the intervention with the year following participant enrollment. Evaluation of this pilot also revealed decreases of 31 and 28 percent in the number of participants reporting unmet physical and mental health needs, respectively (CORE, 2014).

Third, investments in some other social service programs result in improved health outcomes, although their impact on health care costs has not been adequately examined. These include:

- **Income support:** The income support programs for which health effects have been most carefully studied

The GERIATRIC RESOURCES FOR ASSESSMENT AND CARE OF ELDERS (GRACE)

model of care provides low-income individuals age 65 and older with home-based care management by a nurse practitioner or social worker and a geriatric interdisciplinary team.

The COMMUNITY ASTHMA INITIATIVE (CAI)

includes case management, family education, nurse home visits to address medication issues and compliance, connection to primary care, and home environmental remediation for patients ages 2 to 18 with a history of asthma-related hospitalizations.

The BUD CLARK COMMONS

pilot intervention in Oregon was funded through a Medicaid global budget waiver and provided supportive housing services that included case management, community building exercises, and counseling for homeless Medicaid recipients.

include tax credit programs and support provided to low-income individuals with disabilities. The income support programs included in this review (see Section 2: The Health Impact of Social Services—Income Support), specifically the Earned Income Tax Credit (EITC) and Supplemental Security Income (SSI), were associated with better health outcomes for those individuals who qualify for such programs. To date, however, studies examining the impact of these income support programs on health care costs are limited.

- **Early childhood education:** Education is often considered a cornerstone of social services and has been found to be associated with improved health outcomes, although most of the evidence supporting this premise is based on observational rather than interventional studies. Nonetheless, a seminal study in this area found that for children aged 0 to 5 years from disadvantaged backgrounds, participation in high-quality child care and preschool resulted in better health outcomes in adulthood (e.g., lower blood pressure and lower risk of metabolic syndrome) (Campbell et al., 2014). While this evidence supports high-quality early intervention as a means of improving health, previous studies have not adequately examined the impact of educational interventions on health care costs.

Fourth, additional research on the return on investment is needed to fully appreciate and quantify the value of these types of programs.

Though return on investment can be challenging to determine given the fragmentation endemic to the U.S. health care and social service sectors, such evidence is key for funders and policy makers. There are also a number of areas in which more research is warranted to substantiate the results of existing smaller-scale studies or to more comprehensively evaluate the impact of social services on health and health care costs. Lack of evidence to date does not necessarily indicate that a particular program fails to improve health or could result in diminished utilization of services or reduced costs; rather, it often means that sufficient evaluation has yet to be conducted. For instance, more comprehensive evaluations of interventions in the areas of education, income support, the Supplemental Nutrition Assistance Program (SNAP), neighborhood safety and cohesion, and transportation services that examine both health and health care cost impacts would be helpful. Additionally, research on larger-scale implementation of case management and community outreach efforts (such as the use of mobile clinics and community health workers for targeted populations) may yield positive findings to substantiate existing smaller-scale studies. Last, partnerships between health care and social services other than housing—such as education, nutrition assistance, or neighborhood renewal projects—are limited; greater experimentation in these areas may prove valuable.

Fifth and finally, Massachusetts may wish to accelerate ongoing efforts to link health care services and social services.

Successful movement forward will require careful and persistent attention toward facilitating collaboration across sectors. Mechanisms to support such efforts include reinforcement of a common agenda across service providers, linked data and information-sharing systems, and budgeting and evaluation metrics that are aligned to foster joint accountability to common goals across sectors. On a local level, some of these mechanisms are already being explored and created by entrepreneurial programs. From a policy perspective, multiple levers to promote cross-sector collaborations and greater attention to social determinants of health are available, including legislative actions as well as regulatory and reimbursement policies.

Passage of Chapter 224 of the Acts of 2012, *An Act Improving the Quality of Health Care and Reducing Costs through Increased Transparency, Efficiency, and Innovation*, has increased attention to health care spending in the state, and it has also focused attention on the need to ensure “coordinated, patient-centered, high quality health care that integrates behavioral and physical health and produces better outcomes and improved health status” (Massachusetts Health Policy Commission, 2015). Though this vision has largely focused on integration and coordination across physical and behavioral health services, there has been growing interest and attention to the role of nonmedical determinants of health as key components to providing a more integrated system of care and driving toward improved population health (Massachusetts Health Policy Commission, 2015). Development of Patient-Centered Medical Home (PCMH) and Accountable Care Organization (ACO) certification programs provides one means of encouraging provider and payer communities to forge cross-sector collaborations and develop service delivery models that consider the role of both medical and nonmedical services on improving health outcomes. The move toward alternative payment methods and the proliferation of risk-based contracts may also provide vehicles to incentivize stronger focus on the role that social determinants of health play in shaping health outcomes and impacting costs.

INTRODUCTION

Social determinants of health—which encompass social, behavioral, and environmental influences on one’s health—have taken center stage in recent discussions of health policy in the wake of the Affordable Care Act (ACA). Health care providers, particularly those that are forming accountable care organizations (ACOs) or otherwise participating in value-based financing models, are being asked to extend the models’ impact beyond costs and quality of health care into what has traditionally been beyond the providers’ sphere of influence: the health outcomes of the population they serve. Given the vast literature showing that medical care influences only a relatively small portion of overall health (Marmot, 2005; McGinnis, Williams-Russo, & Knickman, 2002), ACO and value-based financing models face substantial challenges in equipping health care providers to achieve improvements in the population’s health. Although health policy makers have traditionally considered nonmedical influences on health to be the domain of other state agencies and nonprofit actors, a reconsideration of how the social determinants of health can be addressed within the current health policy landscape is underway (Crawford et al., 2015; Williams, McClellan, & Rivlin, 2010).

The existing literature is clear about the importance of social determinants of health in improving the health of populations. A rich scientific literature has investigated the relative contributions of genetics, health care, and social, environmental, and behavioral factors in promoting health and reducing premature mortality (Chiu et al., 2009; Lee & Paxman, 1997). These studies uniformly conclude that nonmedical factors play a substantially larger role than do medical factors in health. For instance, as depicted in Figure 1, researchers estimate that access to quality medical care may prevent less than 20 percent of avoidable deaths. The remaining 80 percent of avoidable deaths are attributable to genetics (20 percent) and social, behavioral, and environmental determinants of health (60 percent) (McGinnis et al., 2002). Other studies suggest similar patterns for specific diseases, including high-cost ones such as heart disease, stroke, and diabetes (Hu et al., 2001; Platz et al., 2000; Stampfer et al., 2000).

SOCIAL DETERMINANTS OF HEALTH

The conditions in which people are born, grow, live, work, and age, which influence their health. These circumstances are shaped by the distribution of money, power, and resources at global, national, and local levels. For the purposes of this report, we use the term to mean not only social but also behavioral and environmental influences on health.

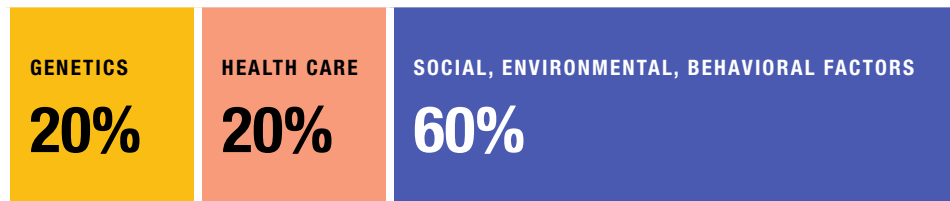
(Adapted from the
World Health Organization.)

ACCOUNTABLE CARE ORGANIZATION (ACO)

Groups of voluntarily associated doctors, hospitals, and other health care providers who are incentivized by the Centers for Medicare and Medicaid Services or a commercial payer to give coordinated, high-quality care to an assigned panel of patients.

(Adapted from the Centers for
Medicaid & Medicare Services.)

FIGURE 1: WHAT DETERMINES HEALTH?
(ADAPTED FROM MCGINNIS ET AL., 2002)



These patterns and other findings (Bradley et al., 2011; Bradley and Taylor, 2013) have led to the policy questions: *Is the U.S. relying too heavily on medical care to promote health while inadequately addressing the social determinants of health? If so, what should be done about it? What is known about the impact of social service investments on health outcomes and costs?* A first step to addressing these questions is a careful assessment of existing empirical evidence.

The empirical literature on the social determinants of health reflects decades of studies that have linked adverse social, economic, and environmental conditions with poor health (Braveman et al., 2010; Freedman, Grafova, & Rogowski, 2011; Myers et al., 2014). A challenge of this literature, however, has been translating its insights into actionable recommendations. The literature that describes efficacious interventions to address social, behavioral, and environmental determinants of health is less developed but is essential to generating integrated, evidence-based approaches to actively create *positive* effects on health and potentially lower health care costs. This gap has slowed health policy makers in promoting innovative models of care despite repeated assertions by public health professionals that nonmedical determinants of health are worthy of attention. Recently, a number of efforts to intervene in the nonmedical determinants of health have been attempted and documented. Still, many policy makers do not know whether these innovative models qualify as being evidence-based and would produce demonstrable health impact at a reasonable cost.

This report summarizes and synthesizes existing evidence about the impact of investing in social services and partnerships between health care and social services, paying special attention to the innovative models for improving health outcomes and reducing health care costs that may be applicable in the Massachusetts policy context. In total, this review includes 60 “gray” and peer-reviewed papers evaluating 35 interventions. Section 1 briefly describes the Massachusetts health policy landscape in order to highlight current opportunities for substantive policy attention to social determinants of health and a focus on reducing the growth in health care spending in the state. Section 2 synthesizes the existing evidence on the health impacts and cost savings associated with investments in various social services such housing, nutritional assistance, and income support. Section 3 identifies a set of innovative programs in which health care providers are expanding their scope of practice to address not only medical but also social determinants of health. Section 4 identifies gaps in the literature and highlights implications and areas for future research. The report closes with a brief summary and conclusion. Appendix A describes the methods used for the literature review, and Appendix B provides a listing of papers and reports that found no effect.

SECTION 1: THE MASSACHUSETTS CONTEXT

Massachusetts has a substantial opportunity to direct attention to addressing the social determinants of health through programs that coordinate health care and social service investments more effectively. For the past several years, Massachusetts state-level policy makers have explicitly focused on controlling health care spending while maintaining or improving the generally good health of the population. As part of its efforts to control medical costs, Massachusetts enacted Chapter 224 of the Acts of 2012, *An Act Improving the Quality of Health Care and Reducing Costs through Increased Transparency, Efficiency and Innovation* in August of 2012. Chapter 224 has the ambitious goal of bringing health care spending growth in line with growth in the state's overall economy. It aims to do this through a number of mechanisms, including the adoption of alternative payment methodologies, expansion of the primary care workforce, and increased focus on wellness and prevention. During the past several years, the adoption of alternative payment methodologies has resulted in movement away from fee-for-service financing of health care services.¹ Related to primary care, the law requires all payers to assign plan members to a primary care provider, a classification that now includes nurse practitioners and physician's assistants.

Last year, the 2014 Cost Trends Report, an annual report required by Chapter 224 to document and describe Massachusetts health care spending, revealed both notable successes and enduring challenges (Massachusetts Health Policy Commission, 2014). On the one hand, per capita total health care costs grew at 2.3 percent, a level below the benchmark set by the Health Policy Commission (HPC) in 2012. Nevertheless, 80 percent of Massachusetts hospitals will be penalized by the Centers for Medicaid & Medicare Services (CMS) for higher-than-expected readmission rates, and almost half of all emergency department visits in 2012 were found to be preventable. Thus, while the state's efforts to reduce health care costs are yielding some positive effects, considerable work is needed to achieve the stated goal of delivering "coordinated, patient-centered, high quality health care that integrates behavioral and physical health and produces better outcomes and improved health status" (Massachusetts Health Policy Commission, 2014). In light of the findings of this report, policy makers may pause to reconsider whether the scope of integration rightly applies only to behavioral and physical health, as understood in Massachusetts, or whether the state might benefit from further integration to include social service investment strategies as well.

In terms of wellness, Massachusetts has also taken action through Chapter 224 to establish a Prevention and Wellness Trust Fund, financed through an assessment on health plans and select acute hospitals. From 2013 to 2016, the Prevention and Wellness Trust Fund is expected to fund \$60 million in projects that have at least one of the following objectives: reduce the rates of common preventable health conditions, increase healthy habits, increase the adoption of effective health management and workplace wellness programs, address health disparities, and build

¹ *Performance of the Massachusetts Health Care System Series: Adoption of Alternative Payment Methods in Massachusetts 2012–2013*. Center for Health Information and Analysis (CHIA), January 2015. Available at <http://www.chiamass.gov/assets/Uploads/APM-Policy-Brief.pdf>

evidence of effective prevention programming. The findings of this report may be of particular interest among policy makers given the emphasis placed on these objectives.

In addition to its value for policy makers, this report may be useful to health care providers looking for guidance on programs that may contribute to health and reduce high health care costs by addressing the social determinants of health. The state's HPC has also been tasked with developing goals and evaluation criteria for Patient-Centered Medical Homes and ACOs, two models that are quickly becoming the norm among Massachusetts health care providers. In January 2015, the HPC proposed eight goals for the ACO certification program, including the following three: promote excellence in identifying population health needs and implementing integrated care delivery models that support those needs, supported by evidence-based guidelines; promote adoption of payment models and provider funds flows that create sufficient incentive to change provider behavior to improve quality and efficiency; and improve access to and quality of health care services for vulnerable populations. The findings included in this report may prove valuable to provider organizations that are pursuing these goals in order to achieve accreditation (Massachusetts Health Policy Commission, 2015).

PATIENT-CENTERED MEDICAL HOME

A health care model that emphasizes relationship-based care, team-based care, and coordinated care as the hallmarks of comprehensive primary care delivery. Key principles include providing a personal physician, a physician-directed medical practice, care for the whole person, care that is coordinated and integrated, and enhanced access to care; ensuring quality and safety; and adopting a payment model that recognizes value.

(Adapted from the National Committee for Quality Assurance, 2014.)

SECTION 2: THE HEALTH IMPACT OF SOCIAL SERVICES

The evidence concerning the impact on health outcomes and health care cost savings is robust for a select set of social services that aim to provide or improve the nonmedical determinants of health. This section organizes social services into the categories of housing, nutritional assistance, education, public safety, and income supports. In each of these categories, the existing literature suggests added investment in effective programming can result in improved health outcomes or measurable health care cost savings. In several cases, the available evidence base indicates that an intervention has the potential to achieve both ends simultaneously. Reported here are only those findings that the original authors deemed statistically significant, unless otherwise stated. Studies with nonsignificant findings are noted and included in Appendix B.

HOUSING

The evidence supporting the direct relationship between housing interventions and health outcomes within low-income or otherwise vulnerable populations is expansive. Whether enabling access to housing, creating a supportive housing environment, or simply expanding the availability of affordable housing to families in lower-poverty neighborhoods, the evidence sug-

gests housing is critical to the health of vulnerable individuals. A total of seven distinct housing interventions were identified in this review (see Table 1: Summary of Housing Interventions). Taken together, these studies indicate that providing housing support for low-income, high-need individuals results in net savings due to reduced health care costs. Furthermore, the evidence indicates that the integration of housing with some health care services can result in improved health outcomes.

TABLE 1: SUMMARY OF HOUSING INTERVENTIONS

	INTERVENTION	TARGET GROUP—PLACE	AUTHOR, YEAR	SUMMARIZED OUTCOMES
1	Housing First	People experiencing chronic homelessness—Seattle and Boston	Larimer, 2009; MHSA, 2014	\$29,388 per person per year in net savings, and \$8,949 per person per year in net savings, respectively
2	Special Homeless Initiative (HI)	Adults with serious mental illness—Boston	Levine, 2007	93% reduction in hospital costs, resulting in \$18 million reduction in health care costs annually
3	10th Decile Project	High-need homeless—Los Angeles	Burns, 2013	72% reduction in total health care costs; positive rate of return as every \$1 invested in housing and support was estimated to reduce public and hospital costs by \$2 the following year and \$6 in subsequent years
4	My First Place	Foster care recipients—California	First Place for Youth, 2012	Better health outcomes; \$44,000 per person per year in net savings*
5	Housing subsidies	Low-income children—Boston	Children's Health Watch, 2009	Better health outcomes; no cost analysis reported
6	Moving to Opportunity (using vouchers)	People living in high-poverty communities—Baltimore, Boston, Chicago, Los Angeles, New York	Sanbonmatsu, 2011; Ludwig, 2011	Better health outcomes; no cost analysis reported
7	Low-Income Energy Assistance Program (LIHEAP)	Low-income children—Baltimore, Little Rock, Boston, Minneapolis, Washington, D.C.	Frank, 2006	Less hospital use; no cost analysis reported

* This savings is calculated based on a comparison of “traditional youth services” (\$72,000) provided to foster care recipients who are not enrolled in My First Place and My First Place services (\$28,000). These figures can be found on page 4 of the original source, available at http://myfirstplace.firstplaceforyouth.org/fpsy_executive_summary.pdf.

The **Housing First** model, a harm-reduction approach in which adults who are homeless and who have mental and behavioral health conditions are provided supportive housing without having to abstain from drugs and alcohol, has been associated with lower health care utilization and net cost savings. In one study, compared with a wait-listed control group, adults participating in a Housing First intervention in Seattle (n=95) experienced a decrease in days intoxicated compared with the wait-listed control group in the year prior to enrollment in the Housing First intervention. Furthermore, Housing First participants had initial median costs of \$4,066 per person per month. These costs included the use and cost of services including jail bookings, days incarcerated, shelter and sobering center use, hospital-based medical services, publicly funded alcohol and drug detoxification and treatment, emergency medical services, and Medicaid-funded services. Median monthly costs decreased to \$1,492 and \$958 after six and 12 months in housing, respectively, and total cost offsets for Housing First participants relative to a control group averaged

\$2,449 per person per month after accounting for housing costs. This resulted in an annual per person per year savings of \$29,388 (Larimer et al., 2009). In another example of success with the Housing First intervention, participants in Boston (n=96) experienced reductions in emergency room visits, days in inpatient care, and nights in emergency shelter compared with the six months prior to participating in the Housing First initiative. After accounting for the annual cost of the intervention (\$15,458), net cost savings to the state from reduced incarceration, Medicaid, and shelter costs were estimated to be \$8,949 per person annually (Massachusetts Housing and Shelter Alliance, 2009).

The **Special Homeless Initiative** (HI) is a second housing-related intervention that has been shown to be associated with health care cost savings. HI is a designated set of resources used by the Massachusetts Department of Mental Health to provide permanent supportive housing arrangements that help tenants retain their housing and achieve stable living situations in the community. Services include protocols for discharge planning, staff training to focus on housing issues, outreach to people with serious mental illness living on the streets or in shelters, development of specialized shelters, and other aspects of homelessness prevention and intervention. Two years after housing placement, the average number of hospital days per client in housing dropped by 93 percent, from 102 to seven hospital days per client (n=453). The total costs to the Department of Mental Health associated with hospitalization dropped from more than \$19 million to just over \$1 million per year (Levine & Meschede, 2007).

A third housing-related initiative with documented health care cost savings is the **10th Decile Project**, a public-private partnership in which hospitals identify the 10 percent of patients who are homeless and who have the highest public and hospital costs (i.e., costs associated with jail, medical, and mental health care). The 10th Decile Project provides immediate services for placing these individuals into permanent supportive housing. Supportive housing is affordable housing that provides access to health and social services, such as mental health and addiction therapy, medical care, and case management. Based on two years of observation (n=163), the total annual average public and hospital costs per person in this program were estimated to have decreased from \$63,808 when homeless to \$16,913 when housed, excluding housing subsidy costs. Total health care costs, including medical and mental health care in jail, were estimated to have declined an average of 72 percent, from \$58,962 per person when homeless to \$16,474 per person when housed. Every \$1 invested in housing and support for the study population was estimated to reduce public and hospital costs by \$2 the following year and \$6 in subsequent years (Burns, Sumner, & Lee, 2013).

Other housing interventions focus on providing social services and support after the individual is housed. One example, called **My First Place**, includes rental housing, case management, education, and employment support services for adults 18 to 24 years old who are transitioning out of the foster care system. In a study of 103 young adults in California after two years of the intervention, participants experienced an increase in self-efficacy, reduction in depression, and increased mental health and medical insurance coverage. In addition, self-reported numbers of stable adults in the life of each participant increased, as did the amount of self-reported support received from an adult. However, the evidence was mixed, as an unexpected increase in drug and alcohol use and frequency of use was also documented within two years after enrollment. The annual cost per participant in this program (\$28,000) was estimated to be substantially lower

than the cost of placement in an adult group home (\$72,000) or the cumulative annual costs of incarceration (\$44,563) or homeless services (\$34,764) (First Place for Youth, 2012).

The remaining evidence on the impact of housing examines the influence of **housing subsidies** on families. A study based on 10 years of cross-sectional data from the metro Boston area found children in subsidized housing to be more likely to be food-secure, less likely to be seriously underweight, and more likely to be classified as “well” on a composite indicator of child health, where “well” is defined as having no developmental concerns or hospitalizations, being at a healthy weight, and having good or excellent health, than a wait-listed control group. Findings from this analysis suggest that affordable housing positively influences the health of children; however, no studies to date address the expected offsets to health care costs (Children’s Health Watch, 2009).

An important avenue of research in housing and health has been a set of studies that examined the impact on children’s health and well-being of moving families out of high-poverty and into low-poverty neighborhoods. One randomized controlled trial (RCT), **Moving to Opportunity**, offered housing vouchers to more than 4,500 families living in high-poverty neighborhoods of five large inner cities, including Boston. Families were randomized into three groups. The first group received federally subsidized rental assistance certificates or housing vouchers that they could use only in census tracts with poverty rates of less than 10 percent, together with counseling to help in leasing a new unit. The second group received Section 8 group vouchers with no restrictions and no moving counseling, and the third group received neither opportunity but continued to be eligible for project-based housing assistance and any other social programs and services to which they would otherwise have been entitled. Four years after enrollment, the individuals in either of the two types of intervention groups (vouchers-only or the vouchers and counseling group) had a lower prevalence of extreme obesity, a lower prevalence of diabetes, and fewer self-reported physical limitations than the non-intervention group. The two intervention groups were similar in their self-reported health status, rates of hypertension, and health-related risk behaviors (Sanbonmatsu et al., 2011).

These results were largely replicated in a second RCT of nearly 5,000 women with children living in public housing in high-poverty urban census tracts. In this study, women were randomized into three groups. The first group received housing vouchers, which were redeemable only if they moved to a low-poverty census tract, where less than 10 percent of residents were poor, and they received counseling on moving. The second group received unrestricted, traditional vouchers, with no special counseling on moving, and individuals in the third group were offered neither of these opportunities (the non-intervention group). More than 12 years later, the prevalence of a body-mass index (BMI) of 35 or more, a BMI of 40 or more, and a glycated hemoglobin level of 6.5 percent or more were lower in the group of mothers receiving the low-poverty vouchers than in the non-intervention group. The differences between the group receiving traditional vouchers and the non-intervention group were not significant, suggesting that moving into a low-poverty area coupled with counseling to do so was pivotal to realizing health improvements (Ludwig et al., 2011).

Housing safety and quality also impacts health and well-being. The federally funded **Low-Income Home Energy Assistance Program** (LIHEAP) provides assistance with costs related

to home heating, medically necessary home cooling, and emergencies due to weather-related supply shortages. One evaluation of this program recruited caregivers of children less than 3 years of age from two emergency departments and three primary care clinics in five urban areas to complete a cross-sectional survey. Families participating in the LIHEAP were compared with families not enrolled in the program. After controlling for background characteristics (i.e., employment of the caregiver and receipt of other means-tested assistance programs), children in LIHEAP families had greater weight for age and lower odds of nutritional risk for growth problems than children in eligible families that were not receiving LIHEAP. Importantly, researchers also found that the LIHEAP children were not more likely to be overweight. Children from households not receiving the LIHEAP also had greater odds than those in recipient households of acute hospital admission on the day of the interview (Frank et al., 2006).

NUTRITIONAL ASSISTANCE

The evidence base outlining health impacts of nutritional assistance programs is robust in comparison to that for many other social service interventions. Herein, we review five interventions based on 13 studies. Taken together, the studies suggest that nutritional assistance for high-risk women, infants, and children, as well as for older adults with functional and cognitive impairments, have been shown to both improve health outcomes and reduce health care costs (see Table 2: Summary of Nutritional Assistance Interventions). We summarize these studies first for women, infants, and children and then for older adults.

TABLE 2: SUMMARY OF NUTRITIONAL ASSISTANCE INTERVENTIONS

	INTERVENTION	TARGET GROUP— PLACE	AUTHOR, YEAR	SUMMARIZED OUTCOMES
1	Women, Infants, and Children (WIC) and Canada Prenatal Nutrition Program (CPNP)	Low-income women and children—selected cities and states (U.S.) and nationwide (Canada)	Foster, Jiang, & Gibson-Davis, 2010; Khanani et al., 2010; Hoynes, Page, & Stevens, 2009; Lazariu-Bauer et al., 2004; El-Bastawissi et al., 2007; GAO, 1992; Muhajarine et al., 2012	Better health outcomes; \$176 million per year in net savings in U.S.
2	Healthy Start	Low-income women and children—selected cities and states	Kothari et al., 2014	Better health outcomes among some groups
3	Food assistance programs	Older adults—nationwide	Kim & Frongillo, 2007	Better health outcomes; no cost analysis reported
4	Resident Opportunities for Self-Sufficiency (ROSS)	Older adults and people with disabilities—Seattle	Siu, 2009	Better health outcomes; no cost analysis reported
5	Home-delivered meals	Older adults—nationwide	Thomas & Mor, 2013a; Thomas & Mor, 2013b; Thomas & Dosa, 2015	Better health outcomes; a 1% increase in meals delivered to the homes of older adults was estimated to be associated with reduction of \$109 million in Medicaid costs; a \$25 annual increase in home-delivered meals per older adult was estimated to be associated with a 1% decline in nursing home admissions

WOMEN, INFANTS, AND CHILDREN (WIC)

A myriad of prenatal health factors have been shown to be integral to health later in life, and thus many social services aim to support prenatal health for vulnerable mothers and their infants.

Historically, WIC has been associated with improved health for children including lower rates of infant mortality, higher rates of full-term births, and heavier birth weight (Foster, Jiang, & Gibson-Davis, 2010). The positive health effects of WIC have been found to differentially benefit the mothers at risk of poor birth outcomes. A study based on three years of observation in one Ohio county (n=24,000) showed that infant mortality rates were lower for WIC participants than for non-WIC participants (8.0 versus 10.6 deaths per 1,000 births) and that among African-Americans, the positive effect was even more pronounced (9.6 versus 21.0 deaths per 1,000 births) (Khanani et al., 2010).

WOMEN, INFANTS, AND CHILDREN (WIC)

Federal assistance program designed to provide nutritious food, nutrition education, breastfeeding promotion, and support to low-income pregnant and postpartum women and infants and children up to age five who are at nutritional risk.

(Adapted from the U.S. Department of Agriculture.)

In addition, eight years of observation of WIC recipients in 2,059 counties nationwide revealed that the implementation of WIC was associated with an increase in average birth weight of 29 grams. Among women with less than a high school education, availability of WIC increases average birth weights (Hoynes, Page, & Stevens, 2009). In a study based on data from New York state's WIC enrollment (n=77,601 records), mothers who enrolled in WIC within the first three months of pregnancy and stayed in for at least seven months gave birth to full-term infants who were 70 grams heavier on average than those of mothers who enrolled later in the pregnancy, and the effect was more pronounced for preterm black and Hispanic mothers (Lazariu-Bauer et al., 2004). WIC was protective against birth outcomes like low birth weight, preterm birth, and infant mortality in Washington state (n=30,751) specifically among high-risk women (El-Bastawissi et al., 2007). Last, a review by the Government Accountability Office (GAO) in 1992 reported that WIC cost \$296 million per year but forestalled more than \$472 million in expected federal and state Medicaid costs, suggesting a net savings of \$176 million per year associated with this program (U.S. GAO, 1992). Thus the literature indicates that investments in prenatal nutrition and support for high-risk women can significantly improve health and reduce health care costs.

Results are similar for the **Canada Prenatal Nutrition Program** (CPNP), which is similar to WIC in the United States. CPNP is a population-level health intervention for at-risk mothers that includes food supplements, dietary assessment, one-on-one or group nutrition and lifestyle education, parenting education, child care support, transportation and breastfeeding preparation. Enrollees from four years of observation (n=250,000) who participated actively in the program (measured by factors including length of enrollment and frequency of contact with the program) were less likely than those that participated less actively in the program to have preterm births, low-birth-weight babies, babies small for gestational age, and babies with poor neonatal health. And mothers participating most actively in CPNP were more likely to have babies who were large for their gestational age than those who did not actively participate (Muhajarine et al., 2012).

Another intervention, called **Healthy Start**, works to prevent infant mortality in 87 communities with high infant mortality rates and high rates of low birth weight, preterm birth, maternal mortality, and maternal morbidity. The goal of the intervention is to improve women's health before, during, and after pregnancy and help families care for their infants through the first two years of life with specific focus on eliminating racial and socioeconomic disparities. Health and supportive services to mothers and children are delivered through breastfeeding promotion, case management, and home visitation (HRSA, 2015). In an effort to explore the potential for differential benefit to black women as compared with white women, one study in Kalamazoo County, Michigan, found that participation in the Healthy Start program was associated with increased birth weights among black women but not among white women relative to nonparticipants with similar demographic characteristics. In addition, when participants were compared with nonparticipants with similar demographic characteristics, no differences were found regarding gestational age or premature birth (Kothari et al., 2014).

LOW-INCOME FAMILIES AND OLDER ADULTS

Food assistance programs are also considered key social service investments in the lives of low-income families and older adults. In elders, a national study addressed the non-nutritional impact of food assistance programs and found that participants in food assistance programs experienced fewer depressive symptoms than nonparticipants (Kim & Frongillo, 2007). While the nation's best-known anti-hunger program for low-income families, the Supplemental Nutritional Assistance Program (SNAP), is not formally included in this review, evidence suggests that it may increase the chances that food-insecure children will become food-secure later in life. Also, a recent study of low-income residents of California analyzed administrative data and found a 27 percent increase in the rate of acute hospital admissions for hypoglycemia in the last week of the month as compared with the first week, which the authors attributed to the depletion of food budgets such as SNAP benefits (Seligman et al., 2014).

Home-delivered meals are another model for providing nutritional support to physically vulnerable and sometimes isolated individuals such as older adults and people with disabilities. Evidence from an intervention based on the **Resident Opportunities and Self Sufficiency** (ROSS) delivery model found that a grocery delivery service was the primary driver of health effects in a sample of older adults and people with disabilities living in Seattle public housing. For example, compared with a non-intervention group, intervention participants experienced a decrease in the percentage of those going without treatment for a chronic condition. Furthermore, compared with a non-intervention group, participants with access to the grocery delivery service (n=53) experienced increased rates of influenza vaccinations and increased mammography screening rates; however, emergency department (ED) use was higher for the intervention group than for the comparison group. Other aspects of the ROSS intervention include case management, resource referral, health and wellness programming, and group activities (Siu, 2009), but no cost information was provided for these components.

About 5,000 nutrition service providers together serve over 900,000 meals a day in communities across the United States via support from the **Older Americans Act** (Administration on Community Living, accessed 5/25/2015). The effect of these meals programs on health has been substantial. One study linked state expenditure data with nursing home data and estimated that

if all states had increased the number of adults age 65 or older who received home-delivered meals in 2009 under the Older Americans Act by 1 percent, annual savings to states' Medicaid programs could have exceeded \$109 million by decreasing the number of nursing home residents who are considered low-care—those who require no physical assistance with activities of daily living (e.g., bathing and dressing) and are not considered clinically complex (Thomas & Mor, 2013a). In another paper, the same authors estimated that a \$25 annual increase in home-delivered meals per adult 65 and older would be associated with a 1 percent decline in nursing home admissions (Thomas & Mor, 2013b). Furthermore, in a recent RCT (n=626), an intervention group of older adults who received daily home-delivered meals had improvements in mental health, improved self-reported health, and lower rates of falls than a non-intervention group (Thomas & Dosa, 2015).

EDUCATION

Education is often considered a cornerstone of social services and has been found to be associated with improved health outcomes, although most of the evidence is from observational, rather than interventional, studies (see Table 3: Summary of Education Interventions). The seminal study in this area, a longitudinal RCT, found that participation in a high-quality child care and preschool intervention for children aged 0 to 5 years and from disadvantaged backgrounds resulted in better adulthood health outcomes, including lower blood pressure and lower risk of metabolic syndrome (Campbell et al., 2014). While this evidence supports high-quality early childhood interventions as a means of improving health, studies that have examined the impact of educational interventions on health care costs are lacking.

TABLE 3: SUMMARY OF EDUCATION INTERVENTIONS

	INTERVENTION	TARGET GROUP—PLACE	AUTHOR, YEAR	SUMMARIZED OUTCOMES
1	Carolina Abecedarian Project (ABC)	Low-income children—North Carolina	Campbell, 2014	Better health outcomes in adulthood; no cost analysis reported

Acknowledged below are several key studies that are not formally included in this review because they do not test interventions or do not report health outcomes that met our definitions but that do demonstrate a positive relationship between education and health. Previous research has indicated that parental education can affect child health status (Currie, 2009); increases in individuals' educational attainment have also been associated with a decrease in risky health behaviors (Heckman, 2010), reduced teenage pregnancy (Harden, 2009), lower risk of coronary heart disease (Manrique-Garcia et al., 2011; Loucks, 2015), greater use of preventive health services (Fletcher & Frisvold, 2009), and improved social outcomes, such as employment rates, over a lifetime (Heckman, Pinto, & Savelyev, 2013).

NEIGHBORHOOD CONDITIONS AND PUBLIC SAFETY

Neighborhood conditions such as public safety and social cohesion have been hypothesized as factors contributing to health and well-being (Diez-Roux & Mair, 2010) although empirical evidence is incomplete. Few interventions have been implemented to demonstrate how neighborhood conditions can be changed over time. This literature review identified one community-based

public safety intervention implemented in cities in two states, supported by four reports, that demonstrates positive health impacts (see Table 4: Summary of Public Safety Interventions).

TABLE 4: SUMMARY OF PUBLIC SAFETY INTERVENTIONS

	INTERVENTION	TARGET GROUP—PLACE	AUTHOR, YEAR	SUMMARIZED OUTCOMES
1	Baltimore Safe Streets Program; Ceasefire Illinois	Urban community experiencing high rates of gun violence—Baltimore and selected urban settings in Illinois	Webster, 2012; Ritter, 2009; Skogan, 2009; Sigurvinsdottir, 2014	Better health outcomes; no cost analysis reported

The identified empirical studies in this area all evaluated a multifaceted community safety intervention program called the Baltimore Safe Streets Program. The program approaches street violence as a public health problem and relies on a theory-driven model of behavior change to create health impacts. Critical to the program design are violence interrupters, street outreach workers to provide role modeling, conflict resolution, and organized community responses to gun violence. An evaluation team found that nine years after the implementation of this program, the prevalence of homicides and nonfatal shooting incidents decreased across all program sites (Webster et al., 2012). The Baltimore experience was an adaptation of a similar program called Ceasefire, initially piloted in seven cities in Illinois, which found similarly promising reductions in street violence when evaluated in 2009 and again in 2014 (Ritter, 2009; Skogan et al., 2009; David, Knoblauch, & Sigurvinsdottir, 2014).

Also acknowledged below are several studies that did not meet the inclusion criteria for this review because they were not interventional studies or did not include health outcomes that met our standard. Nonetheless, they provide insight into the need for further research into the importance of neighborhood conditions on health outcomes. One 14-year national study found that neighborhood cohesion, defined by several indicators of the relationships among neighbors, was associated with a reduced risk of stroke mortality in the community (Clark, 2011). In a nationally representative cross-sectional study, individuals' perception of having parks or open spaces in their neighborhood was associated with lower risk of obesity compared with those who did not have this perception (Sullivan, 2014). Similarly, researchers have found, in a small RCT, that exposure to newly greened urban lots, compared with vacant lots, was associated with reduced heart rates (South et al., 2015).

INCOME SUPPORT

Income support, another social service administered by the state and federal governments, also has been shown to have positive health effects. The income support programs for which health effects have been most carefully studied include tax credit programs and support provided to low-income individuals with disabilities. Reviewed here are two interventions supported by three studies that indicate that income support provided by the **Earned Income Tax Credit** (EITC) and by **Supplemental Security Income** (SSI) is associated with better health outcomes for those individuals who qualify for such programs (see Table 5: Summary of Income Support Interventions). A limited number of empirical studies have examined the impact of these income support pro-

grams on health care costs, which may be of particular interest to policy makers. This gap in the literature provides a clear avenue for future research.

TABLE 5: SUMMARY OF INCOME SUPPORT INTERVENTIONS

	INTERVENTION	TARGET GROUP—PLACE	AUTHOR, YEAR	SUMMARIZED OUTCOMES
1	Earned Income Tax Credit	Low-income families— nationwide	Arno, 2009; Baughman, 2012	Better health outcomes; no cost analysis reported
2	Supplemental Security Income	Low-income older adults— nationwide	Herd, 2008	Better health outcomes; no cost analysis reported

Using state-level data, one national study found that a one percentage point increase in the **Earned Income Tax Credit** (EITC)—a refundable tax credit for low-income working individuals and couples, particularly those with children—was associated with a reduction in the infant mortality rate (Arno et al., 2009). The effect of EITC on children’s health has been further examined through studies of 14 states that expanded EITC eligibility between 1990 and 2006. During this time period, the proportion of children covered by private health insurance increased by 8.4 percent, participation in public health insurance programs fell by 13.9 percent, and children were 24 percent more likely to have visited a dentist one year after the states adopted the EITC. The percentage of children whose mothers reported them to be in excellent health rose by 2.5 percent after EITC adoption; and after fully adjusting for things like family income, enrollment in other means-tested support programs and health insurance, the EITC was associated with an increase in the proportion of children aged 11 to 14 years considered to have a health status of excellent. Interestingly, geographic differences in health effects were also observed. For example, children in nonmetropolitan areas experienced larger reductions in obesity rates than did children in metropolitan areas, suggesting that the expansion of the EITC has an effect on health but that these effects are stronger in nonmetropolitan areas (Baughman, 2012).

The Social Security Administration is another source of income support for vulnerable individuals and administers the **Supplemental Security Income** (SSI) program. SSI provides a stipend to low-income people who are aged 65 years or older, blind, or disabled. Prior examination of this program showed that higher SSI benefits are associated with lower disability rates. Specifically, an increase in \$100 per month in the maximum SSI was associated with a drop in mobility limitations for older single individuals and for older married adults (Herd, Schoeni, & House, 2008).

SECTION 3: THE HEALTH IMPACT OF PARTNERSHIPS BETWEEN HEALTH CARE AND SOCIAL SERVICES

This section summarizes the identified literature as it relates to health care organizations' efforts to form partnerships between health care and social services in order to address both medical and social determinants of health. For purposes of this report, partnerships include such efforts as case management and care coordination, community outreach and mobile van programs, and integrated health care and housing services. As has been the standard throughout, included here are only those findings that were shown to be statistically significant, unless otherwise stated. Studies with nonsignificant results are noted in Appendix B.

CASE MANAGEMENT AND CARE COORDINATION

Case management and care coordination coupled with health care services have been found to be effective in improving health outcomes in selected populations and in relatively small-scale time-limited studies. The targeted populations in this literature have been consistently defined by criteria relating to vulnerability, including adults with physical disabilities (Connected Care Pilot in Pennsylvania), low-income new mothers (Nurse-Family Partnership in Tennessee), older adults with low income (Geriatric Resources for Assessment and Care of Elders [GRACE] in Indiana), and children with low income (Community Asthma Initiative [CAI] in Massachusetts), among others. We identified nine interventions supported by 19 studies (see Table 6: Summary of Case Management and Care Coordination Interventions). Together, the studies suggest that these vulnerable populations experience health gains when their care is coordinated across primary, specialty, behavioral, and social services. Additionally, these studies of case management and care coordination have demonstrated reductions in hospitalizations and emergency department visits; however, few studies have conducted thorough cost-effectiveness analyses to estimate the net savings of such programs.

TABLE 6: SUMMARY OF CASE MANAGEMENT AND CARE COORDINATION INTERVENTIONS

	INTERVENTION	TARGET GROUP—PLACE	AUTHOR, YEAR	SUMMARIZED OUTCOMES
1	Connected Care Pilot	Medicaid recipients living with serious mental illness—Pennsylvania	Kim et al., 2012	Less hospital use; no cost analysis reported
2	Geriatric Resources for Assessment and Care of Elders (GRACE)	Low-income older adults—Indiana	Counsell, 2007; Counsell, 2009	Better health outcomes, less hospital use; cost-neutral for health care
3	Personalized Online Weight and Exercise Response System (POWERS)	Adults living with physical disabilities—Chicago	Rimmer, 2013	Better health outcomes; no cost analysis reported
4	Nurse-Family Partnership	Low-income mothers and firstborn children—Denver, Memphis, and Elmira, MS	Olds, 2014; Olds, 2010; Eckenrode, 2010; Olds, 2007; Olds, 2004.	Better health outcomes; modest net savings over 12-year period (\$789 per family)

(continued)

TABLE 6: SUMMARY OF CASE MANAGEMENT AND CARE COORDINATION INTERVENTIONS *(continued)*

	INTERVENTION	TARGET GROUP—PLACE	AUTHOR, YEAR	SUMMARIZED OUTCOMES
5	Mind, Exercise, Nutrition ... Do It! (MEND)	Children who are obese and their families—Great Britain	Fagg, 2014	Better health outcomes; no cost analysis reported
6	HealthCare Partners; Frequent Users of Health Services Initiative	High-need patients being discharged from the hospital—California, Nevada, Florida	Feder, 2011; Linkins, 2008	Reduced hospital use, and \$2 million annually in net savings for 1,000 members, respectively
7	Senior Care Options in Commonwealth Care Alliance	Older dually eligible adults living with a disability—Massachusetts	Meyer, 2011	Reduced hospital use; no cost analysis reported
8	Community Asthma Initiative	Low-income children living with asthma—Massachusetts	Bhaumik, 2013; Woods, 2012	Reduced hospital use; reduction of costs associated with hospitalizations, positive rate of return on program investment as studies suggested every \$1 invested saved \$1.33 and every \$1 invested saved \$1.46, respectively
9	Washington Heights/Inwood Network for Asthma (WIN) and several similar asthma prevention programs	Children living with asthma—New York City and selected other locations	Peretz, 2013; Karnick, 2007; O'Sullivan, 2012; National Asthma Forum, 2011	Reduced hospital use; health care savings of \$5,166 per child annually

The **Connected Care Pilot** program based in Pennsylvania was designed to integrate care for Medicaid beneficiaries with serious mental illness living in Allegheny County. Along with several partners, including the local office of behavioral health and department of human services, the Pilot implemented interventions including the co-location of physical and behavioral health services at four sites in the county, the creation of integrated care plans supported by physical and behavioral health providers, consumer education about appropriate emergency department use, and care managers tasked with a comprehensive assessment of not only behavioral and physical health but also psychosocial needs. Care managers also made referrals to relevant services and specialists. In an analysis of Medicaid claims and enrollment data for 8,633 Pilot members and 10,514 members of a comparison group, researchers documented a 12 percent decrease in mental health hospitalizations among Connected Care Pilot consumers relative to the projected trend without intervention. Additionally, the all-cause 30-day readmission rate dropped by nearly 10 percent, and emergency department use dropped by 9 percent in the intervention group. These measures increased slightly or remained steady among the comparison group (Kim et al., 2012).

In Indiana, the **Geriatric Resources for Assessment and Care of Elders (GRACE)** model of care is designed to improve the quality of care for community-based low-income seniors, defined as individuals 65 years and older living at home with incomes under 200 percent of the federal poverty level. Between 2002 and 2004, researchers randomized 951 low-income seniors to receive standard primary care or the GRACE model, which included home-based care management by a nurse practitioner or social worker and a geriatric interdisciplinary team that was guided by 12 care protocols for common conditions. After two years of treatment, seniors who had partici-

pated in the GRACE model were more likely to score better on a short-form self-reported health survey. The emergency department visit rate was also lower in the intervention group than in the non-intervention group. When a subset analysis was conducted on patients who had been predefined as high risk, the intervention group also experienced fewer hospital admissions than the control group in the second year (Counsell et al., 2007).

The **Personalized Online Weight and Exercise Response System** (POWERS) model of telehealth weight management incorporates a Web-based physical activity toolkit and regular coaching telephone calls into a standard weight reduction program tailored for adults with physical disabilities. This model was designed in response to challenges that adults with disabilities face in utilizing transportation and finding appropriate health promotion programs that meet their specific needs. An RCT conducted in 2008–2010 with an intervention lasting nine months found that the POWERS model was associated with a reduction (2.1 pounds) in body weight, while the comparison group, which received only the Web-based physical activity toolkit and self-guided health promotion resources, gained weight (2.6 pounds). These are notably modest differences (Rimmer et al., 2013).

Researchers have been following up on an RCT begun in 1990 to assess the effectiveness of the **Nurse-Family Partnership** in Memphis, Tennessee. As an aspect of the partnership, nurses visit the homes of very-low-income mothers who have recently had their first child. To qualify, mothers must have two of the following risk characteristics: unmarried, less than 12 years of education, and unemployed. Nurses' visits to the home are intended to improve prenatal health, improve the children's subsequent health and development by helping the mothers provide more competent care for their babies, and improve the women's health and development by helping them to develop self-care practices, plan subsequent pregnancies, complete their education, and find employment. At 21 years following randomization, the researchers identified a difference in the all-cause mortality rates for mothers who had been visited by the nurses versus those who had not. Similarly, at 20 years following randomization, the researchers identified a difference in the preventable-cause mortality rate among the children in treatment and control groups, with the treated children outperforming their untreated peers (Olds et al., 2014). The positive effects of community-based case management services have been further observed in a longstanding series of studies examining the Nurse-Family Partnership in Denver, Colorado, and Elmira, Mississippi. These studies have consistently found lower rates of infant and child mortality (Olds et al., 2007; Olds et al., 2014), lower total Medicaid spending (Eckenrode et al., 2010) and improved mental health (Olds et al., 2004) relative to groups that did not receive the Nurse-Family Partnership treatment. Moreover, a cost-effectiveness analysis of the Memphis site found a savings in medical and social service spending over a 12-year follow-up period that exceeded program costs by \$789 per family (Olds et al., 2010).

In the United Kingdom, the **Mind, Exercise, Nutrition ... Do It!** (MEND) model is a multicomponent family-based community intervention that aims to support families of children 7 to 13 years old who are overweight or obese in adopting and sustaining healthier lifestyles. More specifically, the intervention (administered in schools and community centers) used education, skills training, and motivational enhancement to achieve improvements in diet and physical activity. In a previous RCT (Sacher et al., 2010), MEND was found to be effective in reducing BMI, improving self-esteem, and reducing psychological distress over 10 weeks. A more recent study reproduces these find-

ings on a population-level scale, enrolling more than 20,000 families for study and finding an average weight loss of 0.76 kilogram (1.6 lbs) (Fagg et al., 2014).

In addition to generating substantial health gains, health care providers have experienced savings using case management and care coordination to expand the determinants of health to which they attend. **HealthCare Partners** piloted two interventions in 2011 to reduce the risk of hospitalization for high-need patients, defined as those who have been discharged from a hospital or who have a select set of chronic conditions including chronic obstructive pulmonary disorder and congestive heart failure, in California, Nevada, and Florida. The first intervention was the creation of Comprehensive Care Centers, where multidisciplinary care teams including physicians, social workers, and case managers have been designed to care for patients in an integrated manner. The second was the development of a home visiting program, where homebound patients could also be assessed and followed by a multidisciplinary team. Taken together, these interventions reduced hospital use among the identified high-need patients by 20 percent over two years. Savings to the system from these interventions were estimated to be \$2 million per 1,000 members annually (Feder, 2011).

Programs based in the health care sector that connect individuals at high risk for the use of costly health care services to established social service organizations in their communities have consistently demonstrated the potential for cost savings. An intervention organized in California called the **Frequent Users of Health Services Initiative** provided frequent emergency department users with case management services following discharge in addition to connecting individuals to local social service organizations. The intervention resulted in a 30 percent decrease in emergency department use in the year following the intervention along with reductions in charges and hospital admissions originating in the emergency department (Linkins, Brya, & Chandler, 2008).

In Massachusetts, **Commonwealth Care Alliance** (CCA) is offering a full spectrum of medical and social services to seniors and people who are mentally or physically disabled. CCA's business strategy is to bring high-quality personalized and round-the-clock care to people with complex medical, social, and behavioral needs. In its Senior Care Options program, CCA funds and provides care for 2,965 members aged 65 and older, most of whom are dually eligible for Medicare and Medicaid and 70 percent of whom are certified for nursing home placement. By pooling the funds from the two government funders, CCA is able to tailor a care plan and give nurse practitioners broad leeway to determine services without obtaining pre-approval from the plan. In 2007, CCA members experienced just 55 percent of the hospital days experienced by comparable dually eligible people cared for by more traditional fee-for-service plans. Between 2005 and 2009, the rate of nursing home placements for CCA enrollees was 30 percent the rate of comparable seniors in Medicaid fee-for-service. Total medical spending in the Senior Care Options program for seniors eligible for nursing home placements grew by an average of 2.1 percent from 2004 to 2009 and by an average of 0.02 percent annually for ambulatory seniors from 2006 to 2009—which the authors suggest is substantially lower than fee-for-service growth rates (Meyer, 2011).

Care coordination and case management has been particularly well researched in relation to several **asthma-prevention programs**. In Illinois, researchers initiated an RCT to compare three interventions aimed at improving the health of inner-city Chicago children with asthma. A total of 212 children were randomly assigned to one of three interventions: asthma education

(lasting 20 to 30 minutes for participant and caregivers), asthma education with reinforcement (the same education as in the first intervention group, plus monthly phone calls and access to an educator's phone number), and reinforced education plus case management (the same reinforced education as in the second group, plus case management services from a nurse practitioner who could be contacted by the health educator as needed). After nine months, each of the three groups had experienced lower rates of health resource utilization in comparison to the baseline year prior to enrolling in the trial. Averaged across all three groups, the magnitudes of declines were substantial: 81 percent for hospitalizations, 69 percent for hospital days, 64 percent for emergency department visits, and 58 percent for clinic visits. Researchers were not able to determine differences between the groups that were statistically significant, but in all cases the third group improved the most. All three groups also experienced substantial declines in health care reimbursements paid by the state, ranging from \$4,115 per child in the first group to \$5,166 per child in the third group. All three groups were found to have a positive rate of return. Accounting for differences in the intensity and costs of the three interventions, the first group was found to have the greatest cost savings, with each \$1 spent resulting in an estimated \$44 in savings (Karnick et al., 2007).

In New York, a retrospective proof-of-concept study was designed to longitudinally assess the impact of changes to the home environment of adults with asthma. These home environment changes were intended to respond to asthma triggers in the home, including cockroaches, mold, rodents, and dust. In all cases, environmental changes were brought about by a legal aid team that worked closely with the academic medical center at which study participants sought care. Although the small study size (n=12) may not have produced results that are generalizable to other populations and settings, researchers identified impressive health impacts associated with the intervention. All participants dropped at least one class in terms of their asthma severity, and the total number of emergency department visits and hospital admissions dropped by 91 percent (O'Sullivan et al., 2012).

Similarly impressive results were reported in 2013 by researchers evaluating the impact of the Boston Children's Hospital **Community Asthma Initiative** (CAI) on emergency department visits, hospitalizations, and quality of life. The CAI intervention includes case management, family education, nurse home visits to address medication issues and compliance, connection to primary care, and home environmental remediation. Practically speaking, home environmental remediation means that CAI may pay for home appliances such as vacuum cleaners and air filtration systems. The evaluation studied 102 patients aged 2 to 18 with a history of asthma-related hospitalizations who enrolled in the CAI during the 2006 calendar year, and it used as a control group a comparable population of 559 children with similar asthma-related health challenges who were not enrolled in CAI. Cost data relating to emergency department visits and hospitalizations was collected for both groups beginning one year prior to and three years following the intervention. Among CAI patients, the proportion of patients hospitalized decreased from 51 percent during the year prior to CAI implementation to 14 percent, 8 percent, and 8 percent in the three years following the intervention; these decreases were larger than those experienced by the patients in the non-intervention group. By incorporating the cost savings associated with these reductions as well as the program cost, researchers identified a positive return on investment over the three years post-intervention. For every \$1 invested, \$1.33 was saved (Bhaumik et al., 2013).

The Boston-based CAI program was further researched to determine cost effectiveness. The evaluation included enhanced care including nurse case management and home visits. Quality was assessed based on parent-completed interviews at enrollment and at six and 12 months thereafter. Costs were calculated based on hospital administrative data relating to emergency department visits and hospitalization between enrollment and two years thereafter. The 12-month data collected on 283 children demonstrated a decrease in asthma emergency department visits (68 percent), hospitalizations (84.8 percent), any days of limited physical activity (42.6 percent), parent missed school (41 percent), and parent missed work (49.7 percent). The researchers found a reduction in hospital costs when the CAI population was compared with a control community and a return on investment of 1.46 (Woods et al., 2012), meaning \$1.46 was saved for every \$1 invested.

In New York, the **Washington Heights/Inwood Network for Asthma** (WIN) has produced similarly impressive results. Families are referred to the WIN program by a network of 300 physicians working in Northern Manhattan, where the asthma rate is four times the national average. Once enrolled, families are connected to a community health worker who provides asthma education, support, and referrals for services such as housing, immigration, and mental health. One analysis conducted with unknown methods suggested that after 12 months in the program, caregiver confidence in controlling the child's asthma increased 40 percent, emergency department and hospitalization rates decreased by more than 50 percent, and child absenteeism decreased by 30 percent (Peretz, 2013). For a snapshot of several dozen more community-based asthma initiatives, many of which incorporate similar tactics to attend to the social and environmental conditions that aggravate asthma, see the National Asthma Forum's 2011 Snapshot of High Performing Asthma Management Programs (National Asthma Forum, 2011).

COMMUNITY OUTREACH AND MOBILE CLINICS

In the area of community outreach and mobile clinics, five interventions reported in six studies are reviewed (see Table 7: Summary of Community Outreach and Mobile Clinic Interventions). Evaluations have reported modest improvements in health outcomes and reductions in health care costs, although comprehensive cost-effectiveness analyses of these programs have not been reported in the existing literature.

In Massachusetts, researchers calculated the health and cost impact of services delivered to people with high blood pressure via a mobile clinic called the **Family Van**. This mobile clinic model is free of charge to patients and staffed by health educators, dieticians, and HIV counselors committed to serving communities that experience poor health and high emergency department usage. Using a sample of 237 patients who presented with high blood pressure between 2010 and 2012, researchers calculated an average reduction of 10.7mmHg and 6.2mmHg in systolic and diastolic blood pressure, respectively. These reductions were in comparison to the baseline blood pressure taken from the patient at first visit and were associated with a 31.0 (systolic) and 33.3 (diastolic) percent reduction in the relative risk of acute myocardial infarction and a 40.4 and 48.8 percent reduction in the relative risk of stroke. In addition to some savings associated with not treating coronary heart disease and stroke, researchers also calculated what cost savings might be attributed to these types of declines in risk, estimating a total savings of about \$1.4 million based on 2,851 emergency department visits avoided. This calculation was based on

TABLE 7: SUMMARY OF COMMUNITY OUTREACH AND MOBILE CLINIC INTERVENTIONS

	INTERVENTION	TARGET GROUP— PLACE	AUTHOR, YEAR	SUMMARIZED OUTCOMES
1	Family Van	Community experiencing poor health—Boston	Song et al., 2013	Better health outcomes; positive rate of return on program investment estimated to be a total savings of about \$1.4 million due to avoided emergency department visits
2	Blueprint for Health, including community health teams	Geographically bounded local communities—Vermont	Bielaszka-DuVernay, 2011; International & LeadingAge, 2014	Less hospital use; 11.6% reduction in total (inpatient and emergency department) hospital costs
3	Health Share, including CTRAIN	Patients with complex, costly needs—Oregon	Klein, McCarthy, & Cohen, 2014	Less hospital use, including an 18% reduction in emergency department visits
4	Pediatric Practice Enhancement Project (PPEP)	Families visiting pediatric clinics—Rhode Island	Silow-Carrol, 2009	Fewer hospital admissions, increased outpatient and emergency room use
5	Church Health Center	Diverse local community—Memphis	Sheehan, Bisognano, & Waller, 2014	Better health outcomes; less hospital use and reduced costs

patient reports that they would have visited the emergency department if they had not visited the mobile clinic (Song et al., 2013).

In Vermont, a statewide program called **Blueprint for Health** has made primary care through community health teams available to all citizens, who need not make copayments, obtain prior authorization, or meet eligibility criteria. Each community health team is staffed by five full-time-equivalent employees (at an annual cost of \$350,000) and serves a population of approximately 20,000 people. A 2008 analysis of utilization patterns in one catchment area found decreases from one year to the next estimated to be 21 percent for inpatient hospital use and 31 percent for emergency department utilization. Overall, total inpatient and emergency department costs for hospital care decreased 11.6 percent (Bielaszka-DuVernay, 2011). A more narrow evaluation of the Support and Services at Home (SASH) program in Vermont found that connecting Medicare beneficiaries with community-based services to help coordinate health care was associated with slower health care spending growth relative to spending for care for Medicare enrollees in neighboring states. The rates of growth for acute hospital services and hospital outpatient services also were lower for SASH participants, although the differences relative to other Medicare enrollees did not reach statistical significance (International & LeadingAge, 2014).

In Oregon, the largest coordinated care organization (CCO), called **Health Share**, has developed a portfolio of interventions that integrate social services and supports with health care provision. The CCO was formed in 2012 from four competing health plans, three county-run mental health agencies, and several health care provider organizations in greater Portland. One exemplary intervention, called **Care Transitions Innovation** (C-TRAIN), supplies intensive post-discharge support to high-utilization patients by providing a nurse discharge planner, pharmacy support, and a programmatic link to a local community center where additional services can be incorporated into the care plan. While these interventions are not solely responsible for the organization's overall performance, they are indicative of its general approach. In 2013, the CCO earned 100

percent of its CMS-supplied performance incentive pool by meeting benchmark or improvement targets, including an 18 percent reduction in emergency department visits among members and enrollment of 80 percent of members into primary care medical homes (Klein, McCarthy, & Cohen, 2014).

In Rhode Island, the **Pediatric Practice Enhancement Project** (PPEP) has experimented with placing parent consultants into pediatric primary and specialty care practices to help families of children with special needs coordinate care and gain access to disparate portions of the health care and social service systems. The parent consultants are parents of special needs children themselves and are placed in 24 practices reaching approximately 8 percent of all children with special needs in Rhode Island. The PPEP program responded to nearly 5,000 family concerns, successfully addressing 69 percent of them and making 3,500 referrals to a range of public and private services, agencies, and programs. An evaluation comparing the health care utilization of PPEP participants and non-PPEP participants between 2004 and 2007 found that PPEP children had more outpatient visits, slightly more emergency room visits, and fewer hospital stays (Silow-Carrol, 2009).

Research on **Church Health Center**, a faith-based health center in Memphis, Tennessee, demonstrated the greatest breadth of social services offered by a health care provider. In addition to traditional health care services, participants were provided with spiritual counseling, cooking classes, and access to health coaches. Investigators found that participants who were enrolled in the program between 2003 and 2011 reported decreased rates of anxiety and depression and reductions in hospital use and costs. Importantly, these health gains were demonstrated in a population that was not preselected for being low-income or otherwise vulnerable (Sheehan, Bisognano, & Waller, 2014).

INTEGRATED HEALTH CARE AND HOUSING SERVICES

A growing literature suggests that partnerships between health care and housing service providers have been effective in improving health outcomes in high-need populations—that is, people who are chronically ill and homeless. We review five interventions that typify this kind of collaboration, reported in five studies. Some studies have shown health care cost reductions, although comprehensive cost-effectiveness analyses have not been reported and represent a gap in the literature (see Table 8: Summary of Integrated Health Care and Housing Services).

A Chicago-based **case management and supportive housing intervention** facilitated by a consortium of 14 area hospitals, respite care centers, and hospitals examined the effect of transitional and subsequent supportive housing on health care use. This intervention randomized adults who were homeless with chronic conditions to either transitional housing and on-site case management or to usual care following discharge from the hospital. The investigators observed a greater reduction in the number of hospitalizations, hospital days, and emergency department visits among the group randomized to the intervention relative to the group remaining in usual care (Sadowski et al., 2009).

Several interventions tested the impact of case management as part of broader housing initiatives on a range of health outcomes. The **Chicago Family Case Management Demonstration** was a partnership between the Chicago Housing Authority and a number of human care services

TABLE 8: SUMMARY OF INTEGRATED HEALTH CARE AND HOUSING SERVICES

	INTERVENTION	TARGET GROUP—PLACE	AUTHOR, YEAR	SUMMARIZED OUTCOMES
1	Case management and supportive housing intervention	Chronically ill individuals experiencing homelessness—Chicago	Sadowski, 2009	Less hospital use; no cost analysis reported
2	Chicago Family Case Management: employment counseling, financial literacy training, relocation assistance, intensive medical case management, and job training	Families living in public housing—Chicago	Popkin & Getsinger, 2010	Better health outcomes; no cost analysis reported
3	Minnesota Supportive Housing: housing and on-site access to nurses and case management	Adults and families experiencing homelessness—Minnesota	National Center on Family Homelessness, 2009	Better health outcomes; cost-neutral or modest cost savings depending on participant type
4	Bud Clark Commons: supportive housing including case management, community building exercises, and counseling	Medicaid recipients experiencing homelessness—Oregon	CORE, 2014	Better health outcomes; less hospital use resulting in 55% reduction in total monthly Medicaid costs
5	Collaborative Initiative to Help End Chronic Homelessness (CICH): permanent housing, supportive primary health care, and mental health and addiction services	Chronically homeless adults—selected cities and states nationwide	Mares & Rosenheck, 2010	Better health outcomes; 50% reduction in health costs amounting to \$13,824 per person per year

including employment counseling, financial literacy training, and relocation assistance. Between 2007 and 2009, the Demonstration also provided wraparound support services, including intensive medical case management and job training to 475 families living in public housing. The intervention was shown to be effective in reducing rates of diabetes, hypertension, arthritis, and obesity. Additionally, intervention participants reported changes of 9 and 11 percentage points in the occurrences of prolonged feelings of anxiety and worry, respectively (Popkin & Getsinger, 2010).

The **Minnesota Supportive Housing and Managed Care Pilot** tested the effectiveness of supportive housing services on self-reported health and quality of life for families who were previously homeless. The intervention provided participants with housing in addition to on-site access to nurses and case management. At the end of the 18-month follow-up period, participants reported fewer mental health symptoms, based on a global scoring index, and improved quality of life. The pilot intervention did not show significant improvements in physical health outcomes after 18 months. Cost savings were neutral for most participants and modest for single adults (National Center on Family Homelessness, 2009).

A pilot intervention facilitated by the **Bud Clark Commons** in Oregon provided further evidence of the relationship between stable housing and improved individual and health system outcomes. The intervention, which was funded through a Medicaid global budget waiver, provided supportive housing services that included case management, community building exercises, and counseling for Medicaid recipients who were homeless. An analysis of Medicaid claims for intervention participants demonstrated a 55 percent decrease in total monthly Medicaid costs

(\$2,006 to \$899) between the year prior to the intervention and the year following participant enrollment. Additionally, the study reported a 14 percentage point decrease in the proportion of participants using the emergency department, a 16 percentage point increase in the proportion of participants with a stable primary care provider, and 31 and 28 percentage point decreases in the number of participants reporting unmet physical and mental health needs, respectively (CORE, 2014).

The **Collaborative Initiative to Help End Chronic Homelessness** (CICH) is a pilot program designed with the goal of eliminating chronic homelessness by providing multiple services, including permanent housing, substance abuse and mental health treatment, and supportive primary healthcare, simultaneously. This multifaceted intervention was cosponsored by three federal agencies: Housing and Urban Development (HUD), the Health Resource Services Administration (HRSA), and the Substance Abuse and Mental Health Services Administration (SAMHSA). Participants (n=734) were recruited from 11 sites nationwide to participate in a preliminary evaluation of this program. Results showed significant improvements in mental health functioning, a 28 to 50 percent reduction in substance use by drug users, and a significant increase in the number of days spent housed over a 12-month period. In addition, a 50 percent reduction in total average quarterly health costs (including the costs of mental health services and substance use disorder treatment as well as medical and dental treatment) was also observed during the study period from \$6,832 at baseline to \$3,376 12 months later amounting to \$13,824 per person per year (Mares & Rosenheck, 2010).

A NOTE ON MEDICAID AND HOUSING

Traditionally, the Centers for Medicare and Medicaid (CMS) has been wary of allowing Medicaid dollars to be used to fund or subsidize housing, arguing that housing falls outside the scope of its mandate. Instead, CMS has encouraged states to create collaborations between state Medicaid offices and state housing authorities to jointly provide supportive housing services to Medicaid beneficiaries. In these situations, Medicaid funds the supportive services and housing agencies fund the housing (Wilkins, Burt, & Locke, 2014).

Some states are actively pursuing ways to more directly use Medicaid dollars to fulfill Medicaid beneficiaries' housing needs. As evidenced in Health Share's programming, select providers in Oregon are able to use Medicaid dollars to pay for housing services for patients due to flexibility afforded by a global Medicaid waiver granted by CMS in 2012 (Klein, McCarthy, & Cohen, 2014). In New York, the Delivery System Reform Incentive System (DSRIP) has similarly allowed New York providers to use state-share Medicaid dollars for nonmedical services including supportive housing (Doran, 2013). California and Illinois both currently have Section 1115 Demonstration waivers under review at CMS that aim to use savings generated from waiver programs to implement supportive housing initiatives.

SECTION 4: GAPS IN THE LITERATURE AND AREAS FOR FURTHER RESEARCH

Reviewing the empirical literature in a given area is useful not only to synthesize an evidence base and describe what *is* known but also to understand what is *not* known. Among the studies included in this review, several limitations should be noted. First, this review highlights a substantial limitation of the existing literature: a lack of thorough investigation into the costs associated with interventions and subsequent savings associated with decreased health care utilization. Second, the rigor of the studies varied considerably despite the authors' efforts to focus on stronger study designs. The evidence reviewed has been created by researchers from a variety of disciplinary backgrounds and methodological traditions, making it difficult to generalize about the methodological rigor of the literature. However, it should be noted that the lack of a comparison group, non-representative sampling, and limited longitudinal follow-up on intervention studies are shortcomings of many of the papers identified in this review. Third, publication bias, where studies without significant findings are less likely to be published, may result in potential overestimates of the impact of interventions reviewed. Although 14 papers were identified that found no effects of the interventions implemented (see Appendix B), many more such efforts have likely been attempted but not published in peer-reviewed or gray literature due to their null findings. As a result, the positive effects documented in the published literature should be considered an upper bound on our understanding of positive impact. Last, the scope of the existing literature, although vast, nonetheless lacks investigations of the impact of investments in transportation, early childhood education and care, and neighborhood conditions on health or health care costs. Although the effects of many of the social services such as education and income support have been thoroughly studied in reference to general well-being or social outcomes, fewer studies document effects on health outcomes or health care costs.

Given the evidence base reviewed in this report, several avenues of and approaches to future research remain available for researchers.

1. **Greater Attention to Health Care Costs:** A primary conclusion of this review is that additional research on the health care cost impacts of various interventions is essential. Although determining the cost effectiveness of interventions can be methodologically challenging given the fragmentation endemic to the U.S. health care sector, such evidence will be key for funders and policy makers who are comparing alternative interventions and assessing value. In the future, research that captures the savings associated with interventions targeted at populations that are not the most vulnerable or the lowest-income may also be of interest.
2. **Further Evaluation of Social Services and Partnership Models:** The gaps identified in this review suggest that additional testing of social service interventions and partnerships between health care and social services is warranted. Particularly, transportation, early childhood education, neighborhood cohesion, and partnerships between health care and social service organizations should be evaluated for health impacts and health care cost offsets. The impact of programs' design features may be

of interest to future researchers, including program characteristics such as issues of governance, generosity of benefits, and staffing approaches. Herein, we have considered all programs in a given category to be roughly equivalent when in fact there may be particularities that make one program more successful than another.

3. **More Robust Research Methods:** The literature could be strengthened by studies that document the impact of social services using rigorous research methodologies. Randomized controlled trials are not always feasible and or appropriate for testing complex social interventions (English, Schellenberg, & Todd, 2011), but for quantitative studies, having a comparison group that does not receive the targeted intervention enhances the credibility of the findings. In addition, partnerships between academic and community institutions are essential to building this evidence base. The C-TRAIN model for optimizing care transitions for Medicaid and uninsured patients in Oregon may serve as an instructive example in this regard. The process by which a team of physicians and health care providers at Oregon Health Sciences University identified the need for and built a program in conjunction with Central City Concern, a local social service organization, is documented in a paper authored by Honora Englander and Devan Kansagara in the *Journal of Hospital Medicine* (Englander & Kansagara, 2012).

CONCLUSION

This review of the literature addressing relationships among health care services, social services, health outcomes, and health care costs identified a number of promising interventions and policy initiatives. Several social services—particularly housing, WIC and prenatal supports, and some food and nutrition programs—are well supported by the literature. Also supported are various models of partnerships between health care and social services including case management and care coordination for targeted populations and partnerships between health care and housing organizations. The literature suggests that these interventions are associated with improved health outcomes and health care cost savings among low-income or otherwise vulnerable populations such as older adults and children. It is critical to highlight the distinction between interventions that improve health outcomes, those that reduce health care costs, and those that both improve health outcomes *and* reduce costs. Several types of programs have been shown to accomplish both goals; we refer to them herein as “win/win” programs. These appear to be the interventions that are the most deserving of immediate attention from Massachusetts policy makers and practitioners.

Health care and social services ultimately share a common goal: fostering a healthy and productive population. In order to achieve this common goal in the most cost-effective way, Massachusetts may wish to accelerate ongoing efforts to link health services and social services.

Successful movement forward will require careful and persistent attention toward facilitating collaboration and coordination across social services and health sectors. Mechanisms to support effective collaboration and coordination include linked data and information-sharing systems, budgeting and evaluation metrics that are aligned with and encourage integration across sectors, and reinforcement of a common agenda. On a local level, some of these mechanisms are already being explored and created by entrepreneurial programs. From a policy perspective, there are multiple possible levers to develop cross-sector collaborations: legislative actions, agency policies, regulatory frameworks, and incentive schemes. With a holistic and shared approach, improved population health can be achieved and sustained at a reasonable cost.

BIBLIOGRAPHY

- Arno, P. S., Sohler, N., Viola, D., & Schechter, C. (2009). Bringing health and social policy together: the case of the earned income tax credit. *J Public Health Policy*, 30(2), 198-207. doi: 10.1057/jphp.2009.3
- Association on Community Living, U. D. o. H. a. H. S. Older Americans Act Nutritional Services. Retrieved 5/13/2015 from http://www.aoa.acl.gov/AoA_Programs/HPW/Nutrition_Services/index.aspx
- Asthmacommunitynetwork.org. Washington Heights/Inwood Network (WIN) for Asthma, New York Presbyterian Snapshot, from <http://www.asthmacommunitynetwork.org/node/3331>
- Baughman, R. A. (2012). The Effects of State EITC Expansion on Children's Health (Vol. Issue Brief No 48): Carsey Institute.
- Bhaumik, U., Norris, K., Charron, G., Walker, S. P., Sommer, S. J., Chan, E., . . . Woods, E. R. (2013). A cost analysis for a community-based case management intervention program for pediatric asthma. *J Asthma*, 50(3), 310-317. doi: 10.3109/02770903.2013.765447
- Bradley, E. H., Elkins, B. R., Herrin, J., & Elbel, B. (2011). Health and social services expenditures: associations with health outcomes. *BMJ Qual Saf*, 20(10), 826-831. doi: 10.1136/bmjqs.2010.048363
- Bradley, E. H., & Taylor, L. A. (2013). *The American Health Care Paradox*. New York, NY: PublicAffairs.
- Braveman, P. A., Cubbin, C., Egerter, S., Williams, D. R., & Pamuk, E. (2010). Socioeconomic disparities in health in the United States: what the patterns tell us. *Am J Public Health*, 100 Suppl 1, S186-196. doi: 10.2105/AJPH.2009.166082
- Brown, R., Carlson, B. L., Dale, S., Foster, L., Phillips, B., & Schore, J. (2007). Cash and Counseling: Improving the Lives of Medicaid Beneficiaries Who Need Personal Care or Home- and Community-Based Services.
- Burns, P., Sumner, G., & Lee, S. (2013). Getting Home: Outcomes from Housing High Cost Homeless Hospital Patients: Economic Roundtable.
- Campbell, F., Conti, G., Heckman, J. J., Moon, S. H., Pinto, R., Pungello, E., & Pan, Y. (2014). Early childhood investments substantially boost adult health. *Science*, 343(6178), 1478-1485. doi: 10.1126/science.1248429
- Center for Outcomes Research and Education (CORE) (2014). Integrating housing and health: A health-focused evaluation of the apartments at Bud Clark. Retrieved 5/13/2015 from <http://shnny.org/images/uploads/Oregon-SH-Report.pdf>
- Children's Health Watch (2009). Prescription for Hunger: Affordable Housing. Boston, MA: Children's Health Watch.

- Chiu, G. R., Araujo, A. B., Travison, T. G., Hall, S. A., & McKinlay, J. B. (2009). Relative contributions of multiple determinants to bone mineral density in men. *Osteoporos Int*, 20(12), 2035-2047. doi: 10.1007/s00198-009-0895-0
- Counsell, S. R., Callahan, C. M., Clark, D. O., Tu, W., Buttar, A. B., Stump, T. E., & Ricketts, G. D. (2007). Geriatric care management for low-income seniors: a randomized controlled trial. *JAMA*, 298(22), 2623-2633. doi: 10.1001/jama.298.22.2623
- Counsell, S. R., Callahan, C. M., Tu, W., Stump, T. E., & Arling, G. W. (2009). Cost analysis of the Geriatric Resources for Assessment and Care of Elders care management intervention. *J Am Geriatr Soc*, 57(8), 1420-1426.
- Crawford, M., McGinnins, T., Auerbach, J., & Golden, K. (2015). Population Health in Medicaid Delivery System Reforms. *Milbank Memorial Fund Issue Brief*, March, 2015.
- Currie, J. (2009). Healthy, wealthy, and wise: Is there a causal relationship between child health and human capital development? *Journal of Economic Literature*, 47(1), 87-122.
- David, H., Knoblauch, S., & Sigurvinsdottir, R. (2014). The Effect of Intensive CeaseFire Intervention on Crime in Four Chicago Police Beats: Quantitative Assessment. Chicago, Illinois.
- De Milton, L. (2013). RWJF Program Results—Cash and Counseling: Robert Wood Johnson Foundation.
- Diez-Roux, A. V., & Mair, C. (2010). Neighborhood and health. *Annals of the New York Academy of Sciences*, 1186(1), 125-145.
- Doran, K. M., Misa, E. J., & Shah, N. R. (2013). Housing as health care—New York's boundary-crossing experiment. *N Engl J Med*, 369(25), 2374-2377. doi: 10.1056/NEJMp1310121
- Eckenrode, J., Campa, M., Luckey, D. W., Henderson, C. R., Cole, R., Kitzman, H., . . . Olds, D. (2010). Long-term effects of prenatal and infancy nurse home visitation on the life course of youths: 19-year follow-up of a randomized trial. *Arch Pediatr Adolesc Med*, 164(1), 9-15. doi: 10.1001/archpediatrics.2009.240
- El-Bastawissi, A. Y., Peters, R., Sasseen, K., Bell, T., & Manolopoulos, R. (2007). Effect of the Washington Special Supplemental Nutrition Program for Women, Infants and Children (WIC) on pregnancy outcomes. *Matern Child Health J*, 11(6), 611-621. doi: 10.1007/s10995-007-0212-5
- Englander, H., & Kansagara, D. (2012). Planning and designing the care transitions innovation (C-Train) for uninsured and Medicaid patients. *J Hosp Med*, 7(7), 524-529. doi: 10.1002/jhm.1926
- English, M., Schellenberg, J., & Todd, J. (2011). Assessing health system interventions: key points when considering the value of randomization. *Bull World Health Organ*, 89(12), 907-912. doi: 10.2471/BLT.11.089524

- Fagg, J., Chadwick, P., Cole, T. J., Cummins, S., Goldstein, H., Lewis, H., . . . Law, C. (2014). From trial to population: a study of a family-based community intervention for childhood overweight implemented at scale. *Int J Obes (Lond)*, *38*(10), 1343-1349. doi: 10.1038/ijo.2014.103
- Feder, J. L. (2011). Predictive modeling and team care for high-need patients at HealthCare Partners. *Health Aff (Millwood)*, *30*(3), 416-418. doi: 10.1377/hlthaff.2011.0080
- First Place for Youth. (2012). More Is Possible: My First Place, A Program of First Place for Youth. Formative Evaluation Findings, June 2010 to March 2012. Oakland, CA: First Place for Youth.
- Fletcher, J. M., & Frisvold, D. E. (2009). Higher Education and Health Investments: Does More Schooling Affect Preventive Health Care Use? *J Hum Cap*, *3*(2), 144-176. doi: 10.1086/645090
- Foster, E. M., Jiang, M., & Gibson-Davis, C. M. (2010). The effect of the WIC program on the health of newborns. *Health Serv Res*, *45*(4), 1083-1104. doi: 10.1111/j.1475-6773.2010.01115.x
- Frank, D. A., Neault, N. B., Skalicky, A., Cook, J. T., Wilson, J. D., Levenson, S., . . . Berkowitz, C. (2006). Heat or eat: the Low-Income Home Energy Assistance Program and nutritional and health risks among children less than 3 years of age. *Pediatrics*, *118*(5), e1293-1302. doi: 10.1542/peds.2005-2943
- Freedman, V. A., Grafova, I. B., & Rogowski, J. (2011). Neighborhoods and chronic disease onset in later life. *Am J Public Health*, *101*(1), 79-86. doi: 10.2105/AJPH.2009.178640
- Gosline, A., & Rodman, E. (2012). Summary of the Chapter 224 of the Acts of 2012. Boston, MA: Blue Cross Blue Shield of Massachusetts Foundation.
- Harden, A., Brunton, G., Fletcher, A., & Oakley, A. (2009). Teenage pregnancy and social disadvantage: systematic review integrating controlled trials and qualitative studies. *BMJ*, *339*, b4254.
- Heckman, J. J., Moon, S. H., Pinto, R., Savelyev, P. A., & Yavitz, A. (2010). The Rate of Return to the High/Scope Perry Preschool Program. *J Public Econ*, *94*(1-2), 114-128.
- Heckman, J. J., Pinto, R., & Savelyev, P. (2013). Understanding the mechanisms through which an influential early childhood program boosted adult outcomes. *American Economic Review*, *103*(6), 2052-2086.
- Herd, P., Schoeni, R. F., & House, J. S. (2008). Upstream solutions: does the supplemental security income program reduce disability in the elderly? *Milbank Q*, *86*(1), 5-45. doi: 10.1111/j.1468-0009.2007.00512.x
- Homelessness, N. C. o. F. (2009). The Minnesota Supportive Housing and Managed Care Pilot—Evaluation Summary. Princeton, NJ: Robert Wood Johnson Foundation.

- Hoynes, H. W., Page, M. E., & Stevens, A. H. (2009). *Is a WIC Start a Better Start? Evaluating WIC's Impact on Infant Health Using Program Introduction*. NBER Working Paper. Retrieved from <http://www.nber.org/papers/w15589>
- Hu, F. B., Manson, J. E., Stampfer, M. J., Colditz, G., Liu, S., Solomon, C. G., & Willett, W. C. (2001). Diet, lifestyle, and the risk of type 2 diabetes mellitus in women. *N Engl J Med*, 345(11), 790-797. doi: 10.1056/NEJMoa010492
- International, R., & LeadingAge (2014). Support and Services at Home (SASH) Evaluation: First Annual Report. Washington, D.C.: U.S. Department of Health and Human Services.
- Karnick, P., Margellos-Anast, H., Seals, G., Whitman, S., Aljadeff, G., & Johnson, D. (2007). The pediatric asthma intervention: a comprehensive cost-effective approach to asthma management in a disadvantaged inner-city community. *J Asthma*, 44(1), 39-44. doi: 10.1080/02770900601125391
- Khanani, I., Elam, J., Hearn, R., Jones, C., & Maseru, N. (2010). The impact of prenatal WIC participation on infant mortality and racial disparities. *Am J Public Health*, 100 Suppl 1, S204-209. doi: 10.2105/AJPH.2009.168922
- Kim, J. Y., Higgins, T. C., Esposito, D., Gerofamo, A. M., & Flick, M. (2012). SMI Innovations Project in Pennsylvania: Final Evaluation Report. Princeton, NJ: Mathematica Policy Research.
- Kim, K., & Frongillo, E. A. (2007). Participation in food assistance programs modifies the relation of food insecurity with weight and depression in elders. *J Nutr*, 137(4), 1005-1010.
- Kothari, C. L., Zielinski, R., James, A., Charoth, R. M., & Sweezy Ldel, C. (2014). Improved birth weight for Black infants: outcomes of a Healthy Start program. *Am J Public Health*, 104 Suppl 1, S96-S104. doi: 10.2105/AJPH.2013.301359
- Larimer, M. E., Malone, D. K., Garner, M. D., Atkins, D. C., Burlingham, B., Lonczak, H. S., . . . Marlatt, G. A. (2009). Health care and public service use and costs before and after provision of housing for chronically homeless persons with severe alcohol problems. *JAMA*, 301(13), 1349-1357. doi: 10.1001/jama.2009.414
- Lazariu-Bauer, V., Stratton, H., Pruzek, R., & Woelfel, M. L. (2004). A comparative analysis of effects of early versus late prenatal WIC participation on birth weight: NYS, 1995. *Matern Child Health J*, 8(2), 77-86.
- Lee, P., & Paxman, D. (1997). Reinventing public health. *Annu Rev Public Health*, 18, 1-35. doi: 10.1146/annurev.publhealth.18.1.1
- Leutz, W. N. (1999). Five laws for integrating medical and social services: lessons from the United States and the United Kingdom. *Milbank Q*, 77(1), 77-110, iv-v.
- Levine, H., Meschede, T., & Burt, M. R. (2007). Outcomes for Clients in the Metro Boston Area Receiving Services to Retain Housing under the Special Homeless Initiative. Evaluation of the Special Homeless Initiative, Massachusetts Department of Health. Washington DC: Urban Institute.

- Linkins, K. W., Brya, J. J., & Chandler, D. W. (2008). Frequent Users of Health Services Initiative: Final Evaluation Report: The Lewin Group.
- Loucks, E. B., Gilman, S. E., Howe, C. J., Kawachi, I., Kubzansky, L. D., Rudd, R. E., . . . Buka, S. L. (2015). Education and coronary heart disease risk: potential mechanisms such as literacy, perceived constraints, and depressive symptoms. *Health Educ Behav*, 42(3), 370-379. doi: 10.1177/1090198114560020
- Ludwig, J., Sanbonmatsu, L., Gennetian, L., Adam, E., Duncan, G. J., Katz, L. F., . . . McDade, T. W. (2011). Neighborhoods, obesity, and diabetes—a randomized social experiment. *N Engl J Med*, 365(16), 1509-1519. doi: 10.1056/NEJMsa1103216
- Manrique-Garcia, E., Sidorchuk, A., Hallqvist, J., & Moradi, T. (2010). Socioeconomic position and incidence of acute myocardial infarction: a meta-analysis. *J Epidemiology and Community Health*, 65(4).
- Mares, A. S., & Rosenheck, R. A. (2010). Twelve-month client outcomes and service use in a multisite project for chronically homelessness adults. *J Behav Health Serv Res*, 37(2), 167-183. doi: 10.1007/s11414-009-9171-5
- Marmot, M. (2005). Social determinants of health inequalities. *Lancet*, 365(9464), 1099-1104. doi: 10.1016/S0140-6736(05)71146-6
- Massachusetts Health Policy Commission, C. o. M. H. P. (2015). January 20, 2015, board meeting presentation. Boston, MA: Health Policy Commission.
- Massachusetts Health Policy Commission, H. P. (2014). 2014 Cost Trends Annual Report.
- Massachusetts Housing and Shelter Alliance. (2009). Home and Healthy for Good: A Statewide Housing First Program Progress Report. Boston, MA: Massachusetts Housing and Shelter Alliance. http://shnny.org/uploads/Home_and_Healthy_for_Good.pdf.
- McGinnis, J. M., Williams-Russo, P., & Knickman, J. R. (2002). The case for more active policy attention to health promotion. *Health Aff (Millwood)*, 21(2), 78-93.
- Meyer, H. (2011). A new care paradigm slashes hospital use and nursing home stays for the elderly and the physically and mentally disabled. *Health Aff (Millwood)*, 30(3), 412-415. doi: 10.1377/hlthaff.2011.0113
- Muhajarine, N., Ng, J., Bowen, A., Cushon, J., & Johnson, S. (2012). Understanding the impact of the Canada Prenatal Nutrition Program: a quantitative evaluation. *Can J Public Health*, 103(7 Suppl 1), eS26-31.
- Myers, V., Drory, Y., Goldbourt, U., & Gerber, Y. (2014). Multilevel socioeconomic status and incidence of frailty post myocardial infarction. *Int J Cardiol*, 170(3), 338-343. doi: 10.1016/j.ijcard.2013.11.009

- National Asthma Forum (2011). A systems-based approach for creating and sustaining effective community based asthma programs: Snapshot of high-performing asthma management programs. Asthmacommunitynetwork.org. Washington, DC.
http://www.epa.gov/asthma/pdfs/snapshot_060111.pdf
- Olds, D. L., Kitzman, H., Knudtson, M. D., Anson, E., Smith, J. A., & Cole, R. (2014). Effect of home visiting by nurses on maternal and child mortality: results of a 2-decade follow-up of a randomized clinical trial. *JAMA Pediatr*, 168(9), 800-806. doi: 10.1001/jamapediatrics.2014.472
- Olds, D. L., Kitzman, H., Hanks, C., Cole, R., Anson, E., Sidora-Arcoleo, K., . . . Bondy, J. (2007). Effects of nurse home visiting on maternal and child functioning: age-9 follow-up of a randomized trial. *Pediatrics*, 120(4), e832-845. doi: 10.1542/peds.2006-2111
- Olds, D. L., Kitzman, H. J., Cole, R. E., Hanks, C. A., Arcoleo, K. J., Anson, E. A., . . . Stevenson, A. J. (2010). Enduring effects of prenatal and infancy home visiting by nurses on maternal life course and government spending: follow-up of a randomized trial among children at age 12 years. *Arch Pediatr Adolesc Med*, 164(5), 419-424. doi: 10.1001/archpediatrics.2010.49
- Olds, D. L., Robinson, J., Pettitt, L., Luckey, D. W., Holmberg, J., Ng, R. K., . . . Henderson, C. R. (2004). Effects of home visits by paraprofessionals and by nurses: age 4 follow-up results of a randomized trial. *Pediatrics*, 114(6), 1560-1568. doi: 10.1542/peds.2004-0961
- Peretz, P. J., Matiz, L. A., Findley, S., Lizardo, M., Evans, D., & McCord, M. (2012). Community health workers as drivers of a successful community-based disease management initiative. *Am J Public Health*, 102(8), 1443-1446. doi: 10.2105/AJPH.2011.300585
- Platz, E. A., Willett, W. C., Colditz, G. A., Rimm, E. B., Spiegelman, D., & Giovannucci, E. (2000). Proportion of colon cancer risk that might be preventable in a cohort of middle-aged US men. *Cancer Causes Control*, 11(7), 579-588.
- Popkin, S. J., & Getsinger, L. (2010). Tackling the Biggest Challenges: Intensive Case Management and CHA Residents' Health. In U. Institute (Ed.), *Brief 3: Supporting Vulnerable Public Housing Families*. Washington DC: Urban Institute.
- Rimmer, J. H., Wang, E., Pellegrini, C. A., Lullo, C., & Gerber, B. S. (2013). Telehealth weight management intervention for adults with physical disabilities: a randomized controlled trial. *Am J Phys Med Rehabil*, 92(12), 1084-1094. doi: 10.1097/PHM.0b013e31829e780e
- Ritter, N. (2009). CeaseFire: A public health approach to reduce shootings and killings. *National Institute of Justice Journal*, 264(November, 2009). Retrieved from <http://www.nij.gov/journals/264/pages/ceasefire.aspx>
- Rosen, M. I., McMahon, T. J., Lin, H., & Rosenheck, R. A. (2006). Effect of Social Security payments on substance abuse in a homeless mentally ill cohort. *Health Serv Res*, 41(1), 173-191. doi: 10.1111/j.1475-6773.2005.00481.x

- Sacher, P. M., Kolotourou, M., Chadwick, P. M., Cole, T. J., Lawson, M. S., Lucas, A., & Singhal, A. (2010). Randomized controlled trial of the MEND program: a family-based community intervention for childhood obesity. *Obesity (Silver Spring)*, 18 Suppl 1, S62-68. doi: 10.1038/oby.2009.433
- Sadowski, L. S., Kee, R. A., VanderWeele, T. J., & Buchanan, D. (2009). Effect of a housing and case management program on emergency department visits and hospitalizations among chronically ill homeless adults: a randomized trial. *JAMA*, 301(17), 1771-1778. doi: 10.1001/jama.2009.561
- Sanbonmatsu, L., Katz, L. F., Ludwig, J., Gennetian, L., Duncan, G. J., Kessler, R. C., . . . Lindau, S. T. (2011). Moving to Opportunity for Fair Housing Demonstration Program—Final Impacts Evaluation: US Department of Housing and Urban Development.
- Seligman, H. K., Bolger, A. F., Guzman, D., López, A., & Bibbins-Domingo, K. (2014). Exhaustion of food budgets at month's end and hospital admissions for hypoglycemia. *Health Aff (Millwood)*, 33(1), 116-123. doi: 10.1377/hlthaff.2013.0096
- Sheehan, A., Bisognano, M., & Waller, R. (2014). Health Care, the Whole Person and Community Engagement: Church Health Center of Memphis, TN. Cambridge, MA: Institute for Healthcare Improvement.
- Siu, C. (2009). Impacts of nutrition and human services interventions on the health of elderly and disabled persons in public housing. Washington DC: Congressional Hunger Center.
- Skogan, W., Harnett, S., Bump, N., & Dubois, J. (2009). Evaluation of CeaseFire-Chicago. Chicago, Illinois: Funded by the National Institute of Justice.
- Song, Z., Hill, C., Bennet, J., Vavasis, A., & Oriol, N. E. (2013). Mobile clinic in Massachusetts associated with cost savings from lowering blood pressure and emergency department use. *Health Aff (Millwood)*, 32(1), 36-44. doi: 10.1377/hlthaff.2011.1392
- South, E. C., Kondo, M. C., Cheney, R. A., & Branas, C. C. (2015). Neighborhood blight, stress, and health: a walking trial of urban greening and ambulatory heart rate. *Am J Public Health*, 105(5), 909-913. doi: 10.2105/AJPH.2014.302526
- Stampfer, M. J., Hu, F. B., Manson, J. E., Rimm, E. B., & Willett, W. C. (2000). Primary prevention of coronary heart disease in women through diet and lifestyle. *N Engl J Med*, 343(1), 16-22. doi: 10.1056/NEJM200007063430103
- Thomas, K. S., & Dosa, D. (2015). More than a meal: Results from a pilot randomized control trial of home-delivered meal programs: Meals on Wheels, America; AARP Foundation.
- Thomas, K. S., & Mor, V. (2013a). Providing more home-delivered meals is one way to keep older adults with low care needs out of nursing homes. *Health Aff (Millwood)*, 32(10), 1796-1802. doi: 10.1377/hlthaff.2013.0390
- Thomas, K. S., & Mor, V. (2013b). The relationship between Older Americans Act Title III state costs and prevalence of low-care nursing home residents. *Health Serv Res*, 48(3), 1215-1226. doi: 10.1111/1475-6773.12015

- U.S. Government Accountability Office (1992). Early Intervention: Federal Investments Like WIC Can Produce Savings. Washington, DC: GAO.
- Vericker, T., & Mills, G. (2012). Childhood Food Insecurity: The Mitigating Role of SNAP: Urban Institute.
- Webster, D. W., Whitehill, J. M., Vernick, J. S., & Parker, E. M. (2012). Evaluation of Baltimore's Safe Streets Program: Effects on Attitudes, Participants' Experiences, and Gun Violence. Baltimore, MD: Johns Hopkins Bloomberg School of Public Health Center for the Prevention of Youth Violence.
- Wilkins, C., Burt, M., & Locke, G. (2014). *A Primer on Using Medicaid for People Experiencing Chronic Homelessness and Tenants in Permanent Supportive Housing*. Washington, D.C. Retrieved from <http://aspe.hhs.gov/daltcp/reports/2014/PSHprimer.pdf>
- Williams, D. R., McClellan, M. B., & Rivlin, A. M. (2010). Beyond the Affordable Care Act: achieving real improvements in Americans' health. *Health Aff (Millwood)*, 29(8), 1481-1488. doi: 10.1377/hlthaff.2010.0071
- Woods, E. R., Bhaumik, U., Sommer, S. J., Ziniel, S. I., Kessler, A. J., Chan, E., . . . Nethersole, S. (2012). Community asthma initiative: evaluation of a quality improvement program for comprehensive asthma care. *Pediatrics*, 129(3), 465-472. doi: 10.1542/peds.2010-3472
- Woolf, S. H., Aron, L. Y., National Academies (U.S.). Panel on Understanding Cross-National Health Differences Among High-Income Countries, & Institute of Medicine (U.S.). Board on Population Health and Public Health Practice. (2013). *U.S. health in international perspective: shorter lives, poorer health*. Washington, D.C.: The National Academies Press.

APPENDICES

APPENDIX A: METHODS

We reviewed the literature on the health impacts and health savings related to three models of social service interventions: traditionally administered social services, existing health service models that have added a social service component (we called these partnerships between health care and social services), and interventions that fully blend health and social service interventions together in innovative ways. We used the PubMed database and included any relevant literature published in English since 2004 up to the October 2014 search date. The keywords used to search for articles related to health outcomes were ‘health,’ ‘health outcomes,’ ‘health saving,’ ‘health costs,’ and ‘health spending.’ Each abstract was reviewed to determine eligibility to be included in our study. Eligibility was determined based on our study’s objective of identifying health outcomes and savings associated with social service interventions. These criteria included:

1. Does the paper evaluate a specific social service intervention or a health service intervention with an innovative social service component?
2. Is the impact of the intervention quantitatively captured in terms of health outcome improvements, reductions in health care utilization, or cost savings?
3. Did the intervention show positive results?

In considering these criteria, we used a stringent definition of a health outcome and excluded common measures such as days of physical activity or insurance status on the basis that they were process measures rather than outcomes.

If the answer to each of the three questions was affirmative, the paper was included in our sample. We did not set any minimum criterion for sample size or study design at this point in the review process. We included interventions that were implemented by the state (WIC, EITC, etc.), by nonprofit organizations, or by health care providers. This search of PubMed yielded an initial sample of 123 unique articles after eliminating duplicates. Three members of the research team screened the abstracts of all articles in this initial sample ($n = 123$). An article was excluded at the abstract screening stage if the study did not meet all three inclusion criteria. During this abstract-review phase, the research team met frequently to corroborate their decision process to ensure inter-rater reliability. Disagreements among team members were resolved through negotiated consensus. We then reviewed the full text of the articles retained following abstract screening ($n = 29$) and extracted relevant data (study design, sample size and composition, and empirical evidence).

We refer to the body of empirical evidence generated by non-academic institutions and/or not formally published as “the gray literature.” To identify the contributions of this massive literature to the relationship between social services interventions and health, we targeted 18 organizations that were deemed to be of relevance to this topic area by the research team and the Blue Cross Blue Shield of Massachusetts Foundation. Each organization’s website was individually searched

using keywords, dates, and relevance sorting where available. Due to the large volume of hits generated from these Web site searches, the titles of all hits were screened first. Following the aforementioned inclusion criteria, a document was first screened into the sample on the basis of its title and abstract or executive summary when available. Subsequently, the full text of the retained abstracts was reviewed and the appropriate information was extracted using the same process as was used in the academic literature review. An initial scan of titles and abstracts on the selected websites yielded 48 papers that were then reviewed in full. Twenty-one papers that addressed the health impact or health savings associated with social service interventions in the United States were ultimately included in the sample.

A third stream of papers came to us through the peer network of the research team as well as the Blue Cross Blue Shield of Massachusetts Foundation. These individuals included researchers, funders, and other health care professionals. Again following the same inclusion criteria described previously, the abstracts of these papers were screened as they were sent to the research team. Data extraction proceeded in cases where all criteria were met, resulting in an additional 10 papers being added to our final sample.

This process of data extraction from the final sample of articles was conducted and reviewed independently by two research team members using a pre-established data extraction form. For each article, the data extraction process identified the study design, sample characteristics, geographic location, description of the social service intervention, and key empirical findings related to health outcomes. Findings were then iteratively grouped into categories according to the type of intervention at the macro level (e.g., social services versus partnerships between health care and social services) and micro level (e.g., housing versus income support versus case management). This taxonomy was refined throughout the data extraction and writing process. After the final categorization scheme was established, the team mapped these categories onto the sample. A total of 60 studies, evaluating 35 interventions, were included.

NOTE: WEBSITES REVIEWED FOR GRAY LITERATURE SOURCES

- | | |
|---|---|
| 1. Anne E. Casey Foundation | 10. Kresge Foundation |
| 2. Center for Health Systems Change | 11. Mathematica |
| 3. Centers for Disease Control | 12. National Health Care for the Homeless |
| 4. Centers for Medicare and Medicaid Services | 13. National Medical-Legal Partnership Center |
| 5. Commonwealth Fund | 14. RAND |
| 6. Economic Roundtable | 15. Robert Wood Johnson Foundation |
| 7. Housing and Urban Development | 16. RTI International |
| 8. Institute for Health Improvement | 17. The Lown Institute |
| 9. Kaiser Family Foundation | 18. The Urban Institute |

APPENDIX B: LIST OF NO EFFECT PAPERS

- Chatterji, P., et al. (2010) Consequences of eliminating federal disability benefits for substance abusers. *J Health Econ* 29(2): 226-240.
- Currie, J. & Moretti, E. Did the introduction of food stamps affect birth outcomes in California? In: Making Americans healthier: social and economic policy as health policy. Schoeni, R., House, J., Kaplan, G., Pollack, H., eds. New York: Russell Sage Press; 2008.
- Hogan, S. R., Speigman, R., & Norris, J. C. (2010). The effects of eliminating supplemental security income drug addiction alcoholism eligibility of mental health of low-income substance abusers. *Soc Work Public Health* 25(5):438-53.
- Jacob, B. A., Kapustin, M., & Ludwig, J (2015). "The impact of housing assistance on child outcomes: Evidence from a randomized housing lottery." *The Quarterly Journal of Economics*: qju030.
- Joyce, T., et al. (2008). Reassessing the WIC effect: evidence from the Pregnancy Nutrition Surveillance System. *J Policy Anal Manage* 27(2), 277-303.
- Kessler, R.C. et al. (2014) Associations of housing mobility interventions for children in high-poverty neighborhoods with subsequent mental disorders during adolescence. *JAMA* 311(9).
- Larrimore, J. (2011). Does a Higher Income Have Positive Health Effects? Using the Earned Income Tax Credit to Explore the Income-Health Gradient. *Milbank Quarterly*, 89(4), 694-727.
- Leung, C. W., Willett, W. C., & Ding, E. L. (2012). Low-income Supplemental Nutrition Assistance Program participation is related to adiposity and metabolic risk factors. *The American journal of clinical nutrition*, 95(1), 17-24.
- Lewandowski, C. A., & Hill, T. J. (2008). The Impact of Foster Care and Temporary Assistance for Needy Families (TANF) on Women's Drug Treatment Outcomes. *Child Youth Serv Rev* 30(8): 942–954.
- Mares, et al. (2004). Outcomes of supported housing for homeless veterans with psychiatric and substance abuse problems. Mental Health Services Research.
- Nicholas, L. H. (2011). Can Food Stamps help to reduce Medicare spending on diabetes? *Economics & Human Biology*, 9(1), 1-13.
- Ver Ploeg, M., et al. (2007). The vanishing weight gap: trends in obesity among adult food stamp participants (US) (1976-2002). *Econ Hum Biol* (1)20-36.
- Walter, S., Glymour, M., & Avendano, M. (2014). The health effects of US unemployment insurance policy: does income from unemployment benefits prevent cardiovascular disease? *PloS one*, 9(7), e101193.
- Zagol, B. W., & Krasuski, R. A. (2010). Effect of motorized scooters on quality of life and cardiovascular risk. *The American journal of cardiology*, 105(5), 672-676.

APPENDIX C: SUMMARY BOXES

SUMMARY BOX 1: IMPROVED HEALTH OUTCOMES AND MISSING OR INSUFFICIENT UTILIZATION AND COST DATA

HOUSING	<ul style="list-style-type: none"> Housing subsidies for low-income families Moving to Opportunity for low-income families
NUTRITIONAL ASSISTANCE	<ul style="list-style-type: none"> Food assistance programs for older adults Resident Opportunities for Self-Sufficiency (ROSS), including grocery delivery service for older and disabled adults in public housing
EDUCATION	<ul style="list-style-type: none"> Carolina Abecedarian Project, high-quality early childhood education for low-income children
PUBLIC SAFETY	<ul style="list-style-type: none"> Baltimore Safe Streets and Illinois Ceasefire, a community-based crime reduction intervention
INCOME SUPPORT	<ul style="list-style-type: none"> Earned Income Tax Credit (EITC) for low-income families
CASE MANAGEMENT AND CARE COORDINATION	<ul style="list-style-type: none"> Personalized Online Weight and Exercise Response System (POWERS) for adults with physical disabilities Mind, Exercise, Nutrition ... Do It! (MEND) for families of children who are obese
PARTNERSHIPS BETWEEN HOUSING AND HEALTH CARE	<ul style="list-style-type: none"> Chicago Family Case Management for families living in public housing Minnesota Supportive Housing for adults and families experiencing homelessness

SUMMARY BOX 2: REDUCED UTILIZATION OR COST DATA AND MISSING OR INSUFFICIENT HEALTH OUTCOMES

HOUSING	<ul style="list-style-type: none"> Housing First interventions for people experiencing chronic homelessness Special Homeless Initiative for adults with mental illness 10th Decile Project, including supportive housing for high health care utilizers Low-Income Energy Assistance (LIHEAP) for low-income families
CASE MANAGEMENT AND CARE COORDINATION	<ul style="list-style-type: none"> Connected Care Pilot for people living with mental illness HealthCare Partners and Frequent Users of Health Services Initiative Commonwealth Care Alliance (CCA) for dually eligible individuals Community Asthma Initiative (CAI) for families of low-income children living with asthma Washington Heights/Inwood Network (WIN) for Asthma and other programs for children living with asthma
COMMUNITY OUTREACH AND MOBILE VANS	<ul style="list-style-type: none"> Blueprint for Health, including community health teams for all citizens Health Share including C-TRAIN for high utilizers of health care resources
PARTNERSHIPS BETWEEN HOUSING AND HEALTH CARE	<ul style="list-style-type: none"> Case management and supportive housing for chronically ill individuals experiencing homelessness

SUMMARY BOX 3: WIN/WIN—IMPROVED HEALTH OUTCOMES AND REDUCED UTILIZATION OR COSTS

HOUSING	<ul style="list-style-type: none">• My First Place, including subsidized housing with case management services for young adults with disabilities aging out of foster care
NUTRITIONAL ASSISTANCE	<ul style="list-style-type: none">• Supplemental Nutritional Program for Women, Infants, and Children (WIC)• Home-delivered meals for older adults• Healthy Start, including home visitation and breastfeeding promotion for low-income mothers and children
CASE MANAGEMENT AND CARE COORDINATION	<ul style="list-style-type: none">• Geriatric Resources for Assessment and Care of Elders (GRACE), including home-based care management for low-income older adults• Nurse-Family Partnership, including home visits by nurse practitioners for low-income first-time mothers
COMMUNITY OUTREACH AND MOBILE CLINICS	<ul style="list-style-type: none">• Family Van, including health educators, dietitians, and counselors for communities with high health-care utilization• Church Health Center, including integrated health, social, and spiritual services for a diverse local community
PARTNERSHIPS BETWEEN HOUSING AND HEALTH CARE	<ul style="list-style-type: none">• Bud Clark Commons, including supportive housing and case management for Medicaid recipients experiencing homelessness• Collaborative Initiative to Help End Chronic Homelessness (CICH), including supportive housing and primary care for individuals who were chronically homeless



FOUNDATION
MASSACHUSETTS